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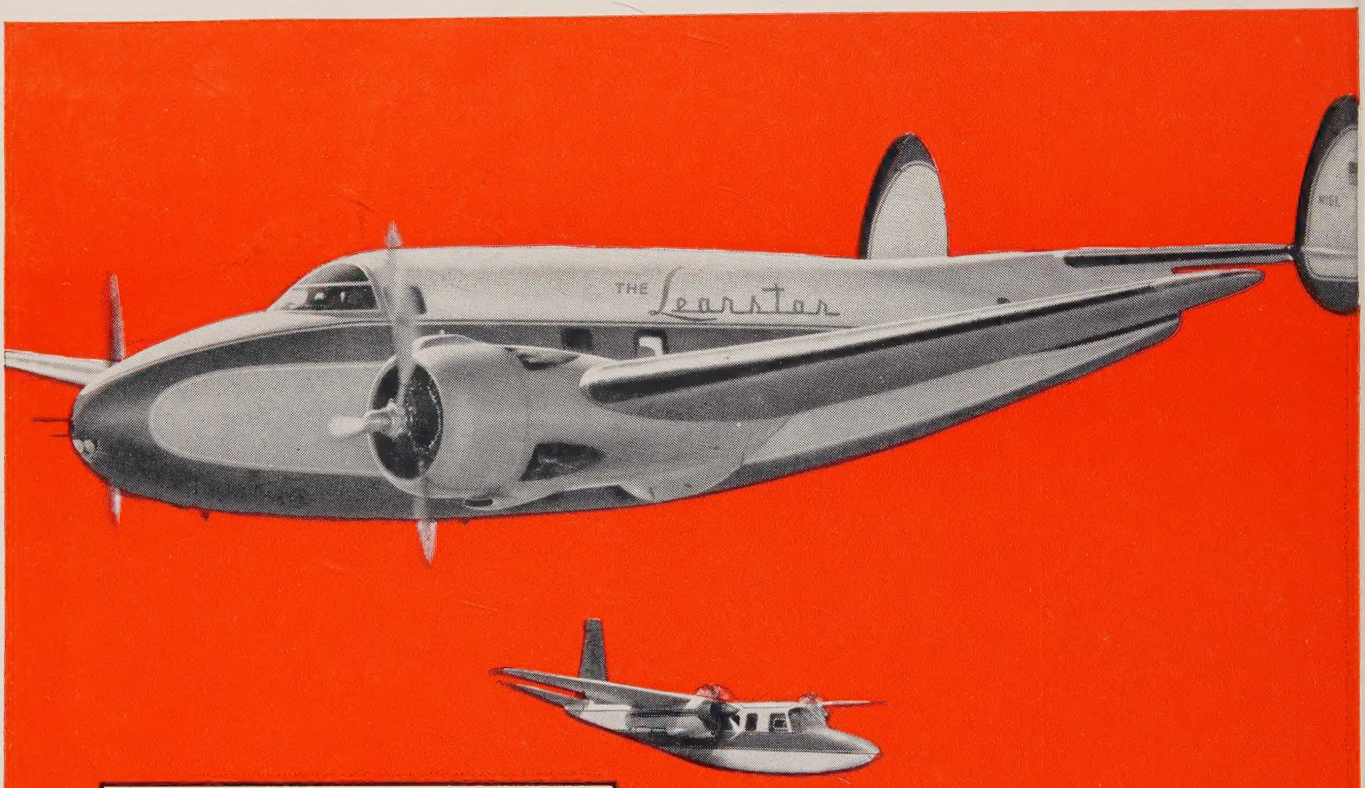
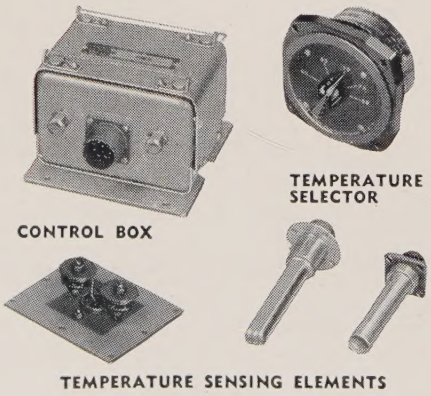


Barber-Colman Company's Aero Commander is equipped with the firm's automatic heater cycling controls. Barber-Colman cabin temperature control systems are also available for other business aircraft such as the DC-3, Lodestar, A-26, B-23, and PV-1. These controls are for both combustion heater and intensifier tube-mixing valve systems. See your conversion center for complete details.

BARBER-COLMAN HEATER CYCLING CONTROL SYSTEM COMPONENTS



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Flight-testing a column of air

Blueprint for the future — that's the Navy's new Flying Platform, built by Hiller Helicopters under the sponsorship of the Office of Naval Research. "Taking it up is as easy as walking", says Hiller test pilot Phil A. Johnson. "You just lean the way you want to go, and you move, riding on a stream of air. The Platform's proved the principle of control by body-balance, which eliminates all the usual controls we've known in the past except the throttle."

The two small engines used to drive counter-rotating propellers in the Platform are fueled with Chevron Aviation Gasoline 80/87. At Hiller Helicopters' plant near Palo Alto, California, Chevron Aviation Fuels are used to provide safe, dependable power in all of the company's experimental and production aircraft.

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Icy Nerves

Getting in and out of a big city on a holiday weekend, of course, calls for icy nerves and a steady hand. Traffic on the George Washington Bridge, from New York City to New Jersey, soars from its daily average of 85,000 cars to as much as 134,000 and jams have developed on Route 17, the feeder line, as far as Monticello, New York, 84 miles from the bridge. C. McKim Norton, vice president of New York City's Regional Plan Association, predicts by 1970 it will take an overnight trip to reach the open countryside. Within 15 years, he said, the New York metropolitan area will be a continous tight packed section extending 40 miles north of Manhattan and 70 miles east and west.

Excerpted from a Wall Street Journal story of June 21, 1955.

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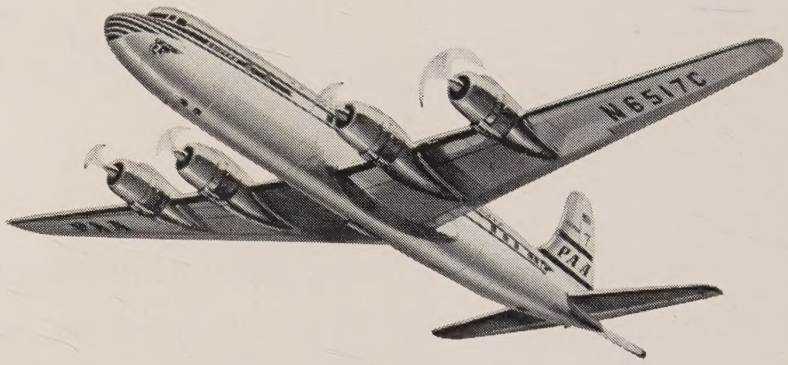

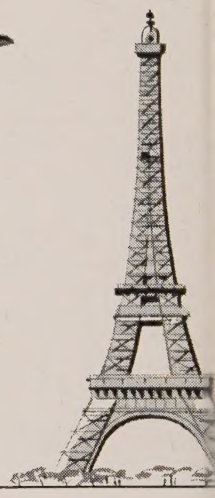

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Champion Spark Plugs Help Pan American World Airways Maintain A Winged Bridge Between New World and Old

Truly significant of the healthy growth of American commercial aviation is the fact that Pan American World Airways has completed its *fifty-thousandth* transatlantic crossing, involving some 150,000,000 miles of flight.

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now hear this . . .

PERSONNEL

Dr. Frederic de Hoffmann has been appointed a vice president of General Dynamics Corporation. He will serve as general manager of the corporation's General Atomic Div.

Lord Balfour of Inchrye has been named a part-time member of the Board of Directors of British European Airways.

R. Vernon Radcliffe recently was appointed Associate Director of the CAB's Bureau of Air Operations. **Joseph C. Watson** was named Chief of the Foreign Air Division of the Bureau of Air Operations.

Dr. Theodore Theodorsen has been appointed director of scientific research, Republic Aviation Corporation.

H. M. (Nobby) **Clarke** was named Sales Planning and Tariffs Manager, North America, for British Overseas Airways Corp.

Harry E. Blythe recently was named Executive Vice President of Bellanca Aircraft Corporation.

W. Samuel Carpenter, III, has been named assistant director of sales of the Du Pont Company's Petroleum Chemicals Div.

Nelson Lee Smith was elected Vice President-Economics of American Airlines. **Tom Holden** elected Assistant Vice President-Properties and Facilities, AA.

L. E. Bessemer, R. T. Cox, J. G. Flynn, Jr., and **M. W. Burrell** have been elected to the Board of Directors of Collins Radio Co. Mr. Bessemer is Vice President, Manufacturing; Mr. Cox is Vice President, Engineering; Mr. Flynn is Vice President, Sales; and Mr. Burrell, a Vice President. J. B. Tuthill was named Assistant Vice President, Finance.

Robert A. Strieby has been named to head a new department established at Kaman Aircraft. Known as Military Operations Research, the department will concentrate its efforts on development of new uses for company products.

H. W. (Bud) **Caward** was appointed system chief pilot for Western Air Lines.

W. H. Yahn has been named general manager of North American Aviation's Fresno, Calif., Modification Center. Engineering Test Pilot **Ray Morris** has been named senior test pilot of North American Aviation's newly formed Electro-Mechanical Flight Test Section. Inspection Test Pilot **Gage Mace, Jr.,** transfers into the Engineering slot vacated by Ray Morris.

(Continued on page 8)

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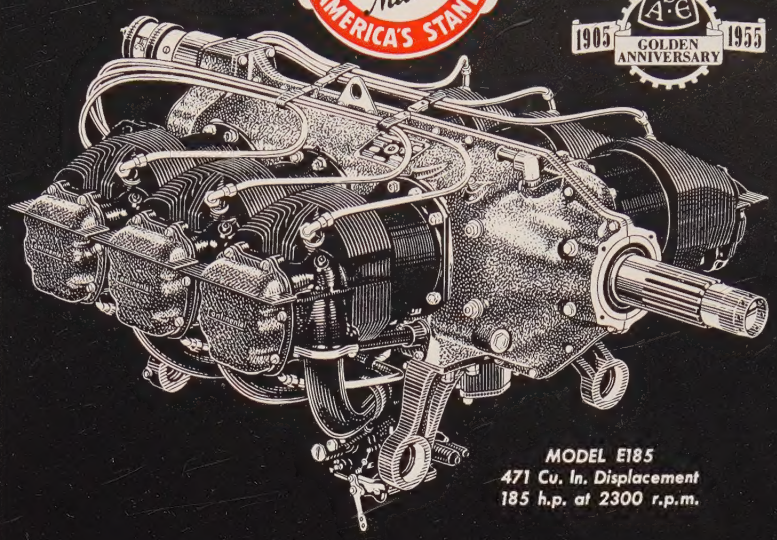

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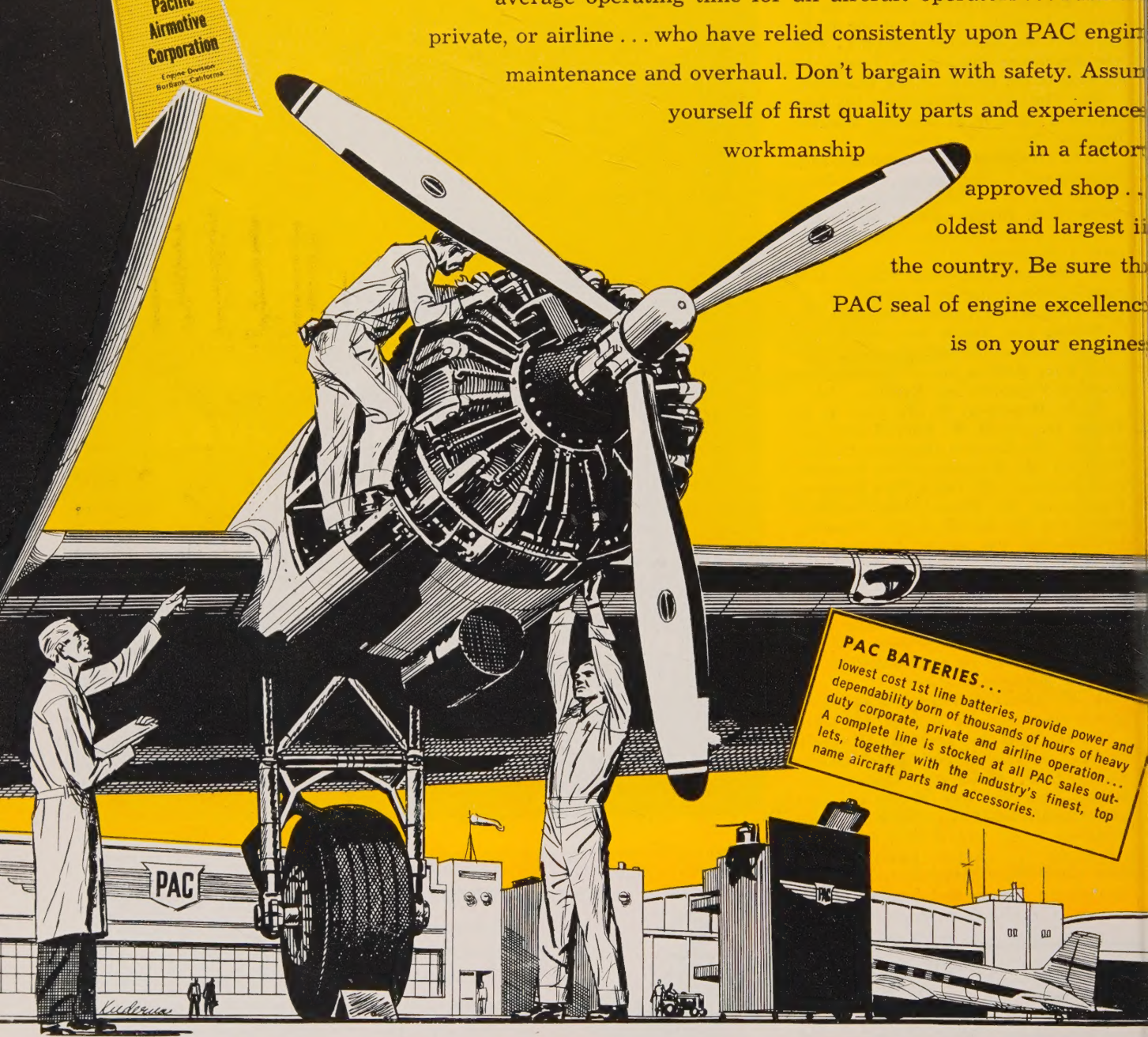

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SEPTEMBER, 1955

Skyways

The Magazine of Flight Operations

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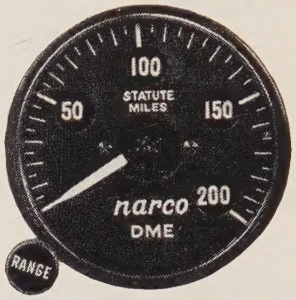

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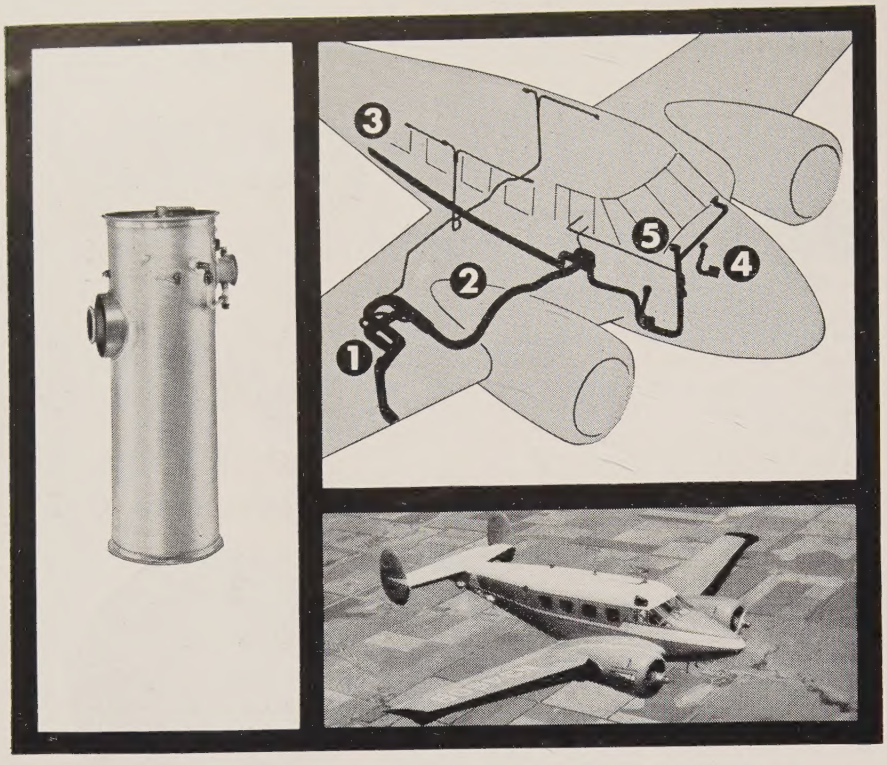

Janitrol heats new Beech Super 18

Pilot comfort, passenger comfort—all the way, wherever business takes you—work or relax aloft when your flying office is heated by Janitrol.

For instance, look inside Beech's Super 18, an eight-place, all metal business aircraft. Its Janitrol "Whirling Flame" combustion heater, an S-100 model adapted to the specific needs of this new craft, provides warm, even temperature—*both* on the ground and in flight.

The heating system shown schematically above, includes (1) the heater itself, adapted to produce 90,000 Btu/hr, (2) the fuel pump, (3) cabin ductwork, (4) defrosters, and (5) the rheostat and on-off switch.

The Janitrol S-50 heater is also Beech's choice for another fine business aircraft, the six-place Twin Bonanza.

Both planes' heating systems are built around Janitrol dependability.

The S-100 and S-50 are part of a complete line of Janitrol aircraft heating equipment for business and utility aircraft. Check your modification center, or write us direct for quick help on your needs. Winter's coming—*now* is the time!

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now hear this

Ralph E. Martin was named Plant Superintendent of Masco Service Corp.

Willis H. Guinn was appointed controller of Ford Aircraft Engine Division.

A. J. Colton was named Manager, Airborne Armament Department, and **Frederick D. Vieth** was named Application Engineer of W. L. Maxson Corporation.

Robert J. Hostetter has been named as sales representative for Pacific Airmotive Aero-Pneumatics Division in the state of Washington.

George Robinson was appointed Sales Engineer for Weber Aircraft Corporation.

Jitsuro Kobayashi has been named assistant to the general manager of sales for Japan Air Lines. His office is in San Francisco.

K. Robert Hahn was upped to Contracts Manager of Grand Rapids Division of Lear, Inc.

Arnold Armstrong has been named Superintendent, Jet Engine Component Production Division of Portland Copper & Tank Works.

Henry M. Amlin has been named Director of Labor Relations for Braniff International Airways.

Walter B. Powell is manager of the new Midwest Division of Van Dusen Aircraft Supplies.

J. D. Wethe has been named manager of marketing for the Evendale Operating Department of General Electric's Aircraft Gas Turbine Division.

HONORS

J. F. (Skeets) **Coleman,** engineering test pilot for Convair, **Capt. Marion H. Epps,** USN, named winners of 1955 Harmon International Air Trophy Awards.

Lucille T. Cheetham was awarded the 1955 Amelia Earhart Memorial Scholarship by the Ninety-Nines, Inc.

Lawrence D. Bell, president of Bell Aircraft Corp., was presented The Exceptional Service Award by the USAF.

Henry Blackstone, president of Servo Corporation of America, elected a Vice President of the Institute of Navigation.

Cmdr. H. C. Goodhart, British Royal Navy, won the first of the Richard C. duPont Memorial Goal Awards for the fastest non-stop glider flight from Elmira, N. Y. to the duPont Airport, Wilmington, Del. His time was five hours, 47 minutes over the 180-mile course.

COMPANIES

General Electric's Aircraft Products Department recently was awarded a $6,000,000 contract for remote-controlled, radar-directed armament systems for Boeing B-47 bombers.

(*Continued on page* 38)

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industry notes . . .

■ Republic Aviation's XF-84H turboprop fighter recently made its first flight at the USAF's Flight Test Center at Edwards AFB. The fighter remained aloft for 35 minutes, most of the time at 20,000 feet. Powered by the Allison XT-40-A-1 twin power unit turboprop engine developing 5,850 equivalent shaft horsepower at take-off, the XF-84H is said to be the fastest single-engine prop-driven aircraft ever built, and it is expected to be even faster when fitted with an afterburner. The 84's prop is a supersonic one built by Aeroproducts Division of General Motors. Other supersonic props, built by Curtiss Propeller and Hamilton Standard, will be tested on the "H" in the near future. The aircraft is a single-seater with a range of more than 2,000 miles and a service ceiling above 40,000 feet. Interesting feature of the XF-84H is a Republic-designed vortex gate, a triangular fin mounted atop the fuselage just aft of the cockpit canopy to partially neutralize the torque set up by the rotating prop. (See cover photo)

■ The first airplane to be equipped with All American Engineering's retractable hydro-lift, a landing gear that permits a landplane to operate from any surface (water, snow, mud, ice and runways), has flown successfully. The hydro-lift-equipped plane, a low-wing, single-engine Bellanca *Cruisemaster*, made several landings and take-offs from water, sod and hard-surfaced runways. Resembling a pair of short wide skis with wheels protruding from the center, the hydro-lift fits snugly under the wing when it is retracted and has no appreciable effect on the Bellanca's performance.

■ Lycoming's new gas turbine engine, the XT-53, will power the utility helicopter being developed by Bell Aircraft for the Army. Designated the Bell XT-40, the copter will have an 800-lb payload and a cruising speed of 100 nautical mph. The XT-53 engine, often described as a "workhorse" engine, was designed for fixed-wing aircraft as well as helicopters. The copter version is rated at 825 hp for military power, and 770 hp for maximum continuous power.

■ Following announcement by Secretary of the Air Force Talbott that there was no objection to Boeing building commercial jet aircraft concurrent with its production of military jet tanker-transports, Boeing Airplane Company stated that it was taking immediate steps to negotiate firm contracts with the commercial airlines. The jet *Stratoliner*, a commercial version of the prototype 707, will be a four-jet, swept-wing transport carrying from 80 to 135 passenges and having a speed in the 550-mph range. Its gross weight will be greater than the 707 prototype, but less than the KC-135 tanker-transport. Boeing has indicated it can deliver on a basis which would permit start of scheduled airline operation early in 1959.

■ Under contract with the Special Devices Center of the Office of Naval Research, Bell Aircraft has developed a Helicopter Flight Simulator to help train copter pilots quickly, inexpensively and safely without leaving the ground. As the pilot moves the controls and "flies" the simulator, the scenery projected on a panoramic screen changes as if he were actually in the air. Fuselage vibration is built in, as are engine and rotor noise, rough air and actual control forces. One pilot dramatically illustrated the authenticity of the flight illusion during a test when he could not bring himself to step out of the simulator's cabin while the altimeter registered an altitude of 50 feet. The Model 2-FH-2 simulator is scheduled for early installation at the Navy's flight school in Pensacola, Florida.

■ Frank Piasecki, former Chairman of the Board of Piasecki Helicopter Corp., has left Piasecki Helicopter to form his own company, Piasecki Aircraft Corporation. Disagreement with other board members over Piasecki Helicopter's research and development program is said to have been the motivating force behind Mr. Piasecki's move. Don Berlin, president of Piasecki Helicopter, has announced that a new name for Piasecki Helicopter Corp. will be forthcoming and that the company is progressing with its plans to enter the VTO field. Piasecki Aircraft Corporation will specialize in furnishing especially developed processes and skills to other manufacturers, will produce components for other companies in or out of the aviation field, and will do considerable research and design work.

■ For the first time, the U.S. Navy has a high-speed jet aircraft drone approximating the performance and size of a fighter plane. A new target drone version of Chance Vought's *Regulus* guided missile has been delivered to the Navy for operational use. Designated KDU-1, it resembles the flight test and training version of the *Regulus* externally, but its internal construction has been revised to meet its particular mission.

■ When the USAF's C-130 *Hercules* combat transport goes into operational use, air-drop delivery of heavy military weapons, vehicles and equipment from low altitude will become a more widespread practice. The new-type air freighter's large rear ramp, an integral part of the airplane and operable in flight, will simplify and speed up paradropping techniques for heavy cargo items. Lockheed Aircraft's Georgia Division has developed an "aerial delivery system" which enables C-130 pilots to air-drop a planeload of military freight within a few seconds. New system is presently undergoing joint Air Force and Army tests. Although designed for C-130, it can be adapted to other USAF cargo planes.

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HELIO COURIER

by G. W. Heath

Flight Safety Foundation

LANDING STRIP *for Helio Courier can be any relatively level area 100 yards long. Courier is shown here tied down on polo field of the El Conquistador Hotel in Tucson, Arizona. Helio President Lynn Bollinger, standing by the plane, flew the Courier west*

Not the fastest airplane, not the slowest, not the greatest load carrier, and not a vertical riser—but probably the most progressive combination of all these characteristics in a useful, economical, and safe airplane on the market as of July 1, 1955.

It was with a sense of both excitement and relief that I came away from a searching discussion of Helio Corporation ideas and a flight in their four-place, all-metal *Courier* with Helio's president, Lynn Bollinger, at the corporation's home base, Norwood, Mass. The excitement arose from the realization that an entirely new area of flight, an approximation of convertiplane performance, was here now. And, in an age in which every citizen finds himself sweating out scientific break-through for his very survival and is forced to contemplate the effects of one revolutionary concept after another, it was a relief to see progress which offers a welcome way of easing and extending our everyday life in the field of business operations and personal transportation.

Otto C. Kopen, the Helio designer, is Professor of Aeronautical Engineering, in charge of Massachusetts Institute of Technology's aeronautical design courses; Lynn L. Bollinger, a Professor of Business Administration, Harvard Business School until his resignation this year to devote full time to the Helio Corporation, has had a varied background in aviation. A graduate of Harvard Business School, he returned after four years in the field as a fixed-base operator to teach Corporation Finance. During World War II, he was engaged in aviation research on terminal airports during the course of which he served on-the-line as an airline pilot. After VE day, his aviation economic research led him to a study of the personal flying field. Charged with preparing recommendations and information on increasing small airport facilities to serve the great rise expected in the number of privately owned planes, Bollinger's report, written in 1948, was prefaced by a pessimistic introduction that the numbers of fixed-base operators would not increase as anticipated; and while offering constructive material on profitable airport operation, he warned that "the basic weakness of the industry was found to be attributable not so much to the obvious inadequacies of capital and management employed in sales and service operations, . . . but more to inherent limitations of the product itself."

The postwar steady decline of the private-plane market bore out this opinion. Selling airplanes from department store floors and other manifestations of unrealistic wishful thinking of "200,000" private planes were no more than a retreating myth and we realized that the only solid sales with the airplane that was offered on the postwar market were to the owner who could realistically afford the price of upkeep and could put a trained pilot behind the wheel, himself if he was qualified, or a hired one (the beginning of the business flying market). The short-lived boom was based on what people mistakenly thought was being sold to them—a safe airplane that was easy to fly

and one in which they could hop about the country operating practically door to door. Recognition of the disparity between the products actually available and the desire of a potential private-plane market was the challenge which brought the Helio Corporation into being. Both Bollinger and Koppen were convinced that with the then-available knowledge from NACA research on high-lift devices, an airplane could be marketed which would answer the established requirements.

Although offering almost revolutionary performance, the Helio *Courier* is nothing new. Slats have been used for years; large span slotted flaps also have been used for years and most of the *Courier's* other features are time-tested and well known.

Performance-wise, the Helio *Courier* can:

1. Land and take-off on a one-way strip, under no-wind conditions, in from 75 to 100 yards, the variation in length depending on the pilot's experience flying the airplane, the altitude and the temperature.
2. Climb and make a tight turn safely in any flight condition, even immediately after take-off, at as low as 40 mph and at a sharp angle of climb.
3. Fly at 30-40 mph with excellent control.

A walk-around inspection of the Helio *Courier* quickly discloses the features that make possible its performance and safe operation. The slats which are in two movable sections along the span of each leading edge, "pop" out automatically via the suction of the negative pressure at the leading edge as the angle of attack increases. In effect, slats enable the airplane to fly at higher angles of attack (with the slats out, a "new" path is made requiring less deflection to follow the contour of the wing). A line check prior to flight always should include reaching up and pulling out the slats, and their operation should also be check in flight. The *Courier* can be flown safely without them, but not at such low speeds. Actually, the plane has been test flown with both sections on one side bound in a closed position and no control problem was posed.

DESIGN *feature attractive to pilots is Courier's hip-height gascolator, fuel drain*

With the slats popped out and the wheel full over laterally, if you look you can see just behind the slat gap the biggest contribution to the Helio's performance, namely, four little "spoiler" surfaces which rise up to act on the air flowing over the leading edge. There have been planes which could fly at very low speeds—the famed German Fiesler *Storch*, for example, the US Army L-1 and other observation planes, but with all of them, lateral control at slow speeds was inadequate. This missing link also plagued the first Helio plane flown experimentally in mid-1949. Dr. Koppen found his solution in recent British experiments on partial blocking of the flow of air through the slat gap. These spoiler surfaces on the *Courier* produce high rolling moments at slow speeds which actually increase as the speed decreases (the area where lift is produced moves forward and is concentrated in the area dominated by the slat). This means that, unlike its slow flying but laterally inadequately controllable predecessors, the Helio *Courier* does not have to "speed up" to give the pilot good control in landing. The Helio pilot does not have to fear the usual aileron reversal at slow speeds.

Accident statistics show that about 50% of all fatal accidents occur as a result of stalls. The usual pattern, even in the highly touted two-control airplanes, is that when a wing drops at slow speeds and the aileron is depressed in an effort to increase the lift on the low wing, the low aileron instead of raising the wing increases the drag to the point where the low wing is further slowed up and the plane falls off. When the slats pop out in the Helio, these spoiler surfaces are extremely effective because they are located where they really bite the air. They are actuated by large lateral displacement of the wheel and are, of course, effective principally when the slats are out.

Slotted flaps which extend three-quarters of the span of the trailing edge of the wing give the Helio its high lift at slow speeds. Like the Fowler-type flaps, they are displaced rearward as they are lowered.

The tail section is large and the fuselage is relatively long, the greater tail surface providing high directional stability. The entire subject of stability is one which is close to the hearts of Koppen and Bollinger

SLATS *on leading edge of plane's wings enable it to fly at higher angles of attack*

from point of view of their Helio design. The structural failures that have occurred in lightplanes, they feel, bear no relation to lack of structural integrity, but rather to lack of stability. In other words, the pilot imposes too great a force on the airplane in trying to recover from a dangerous attitude that is the result of a lack of stability. The *Courier's* tail does not have the conventional movable elevators and fixed horizontal tailplane structure; the weight and drag is cut almost in half by combining them in one surface extending across the entire tail section, and called a stabilator. It is actuated by the usual down or up elevator movement of the wheel. A trim surface is located on the left rear of the stabilator and functions the same way as any conventional trim tab. On the right rear of the stabilator is a freely moving surface, identical in size to the trimming surface, which counter balances any displacement of the stabilator, tending to return it to "neutral" ("neutral" being governed by the setting of the trim surface). The wing tips and stabilator tips are constructed of Fiberglas, a material that remained unmarked after blows with a hammer and a baseball bat. The baseball bat produced some paint chipping, but that's all.

The landing gear has an interesting built-in crash-worthy feature. First of all, excessive strength with respect to fore and aft deflection of the landing gear is something you do not want. If an overly rigid gear hits an obstruction, it will remain intact and shear off at the cabin-to-gear joint, exposing the cabin to severe damage if not destruction. And the landing gear structure must not be so weak that on impact it will collapse completely, again leaving the cabin exposed. As an answer to this the Helio offers a "V" brace on the gear struts which is very strong at the cabin-to-gear attachment but has

its weakest point at the lower part of the brace (approximately one quarter of the way down the Helio landing gear strut). Thus, on impact the lower structure will either wipe off or fold back, absorbing some of the crash deceleration forces and leaving a stub, very strongly attached to the cabin structure, which keeps the cabin intact.

Inspecting the cabin itself, you will note that all Helio planes are equipped with the Griswold shoulder harness-safety belt combination (15 g seat and belt strength). The cabin structure is steel tubing throughout and there are two prominent braces running diagonally across the windshield area to prevent the engine from pushing back into the cabin on exposure to a high crash force. This cross-bracing is termed "inter-ocular," and does not interfere with visibility.

Features of the Helio not related to its slow-flight performance nor safety but interesting from a prospective owner's point of view include unique placement of the gascolator and fuel tank drain valve so that preflight checks do not fill your coat sleeve with trickles of gas. It's located very handily, about hip height, on the outside of the fuselage behind a Dzus-fastened panel. Very prominent is the large ejector tube beneath the engine which provides adequate cooling even with continued operation at slow speeds. The cabin is accessible by a large door on each side, staggered left front and right rear. The baggage bin measures three feet square. With full tanks and four occupants, the *Courier's* bin can carry a capacity of 200 pounds. Rear seats can be removed by taking out four bolts, providing a floor space six feet by three and one half feet, which could accommodate an object as long as a bicycle and still have room to spare.

To get into the airplane, there is a step provided at the entrance door on the pilot's side.

The cockpit layout is standard: flight instruments in front of the left seat, engine instruments in front of the right seat, the fuel selector switch on the right alongside the right seat. There are two 30-gallon tanks which feed into one valve so that the fuel selector switch is a simple "On/Off" handle with no danger of switching to a dry tank. Also, if the engine is started by mistake with the fuel selector switch in the "Off" position, the fuel in the line will be exhausted very quickly so that under ordinary circumstances it would be impossible to take off with the gas off. Helio designers have tried in every way to design against inadvertent pilot slips.

The *Courier* has a key-type ignition with the master switch, fuel gauge selector, radio, and turn-and-bank toggle switches on the lower left of the panel. The gyro for the turn-and-bank is driven electrically while the compass and artificial horizon are run by suction provided through the vacuum system—in effect, an "alternate-source" arrangement. Located on the lower right of the panel are the navigation lights, the fuel booster pump, and cabin light toggle switches, head set plug in and fuses. The fuel pump is used, but not vital, for take-off and landing. Primer, throttle, prop control, mixture and cowl flap control are in the lower center of the panel. A carburetor heat control is provided but very seldom used with the pressure-type carburetor on the Lycoming 260-hp engine. A smaller trim handle, trim indicator, and a large flap handle are located together overhead in the center above the panel. The trim handle is cranked eight revolutions each way from neutral for full nose-up or nose-down position. Fifteen revolutions is full travel of the flaps.

The seat belt and harness installation is worn as one unit—simply let the single shoulder harness on right of the seat fall over right shoulder and buckle the seat belt. Correct restraining action is provided with no sense of limitation in movement.

Starting, taxiing and pre-takeoff procedure are standard. Ground steering on the *Courier* is by means of the hydraulic brakes (the tail wheel is not steerable), and the main wheels are sufficiently far forward that control-wheel position when taxiing downwind is not critical. Taxing downwind, even with the wheel full back, there was no feeling of the tail being light. Visibility over the nose is about the same as other airplanes of its general class—the nose appearing to extend up at an angle of approximately 10°; S-turning is required to inspect the area close ahead. With crosswind gear some people have hit upon taxiing straight ahead with the cabin cocked off center so that visibility ahead is excellent out the side of the windshield. Crosswind gear is set rather tightly on the Helio airplane to eliminate what crosswind-gear pilots call a "squishie" feeling.

Before take-off, the usual engine run-up, control and instrument checks were made and the trim tab put at neutral, but from there on it was an entirely new experience. To comprehend just what short take-off performance is, the uninitiated are usually given a half-flap take-off, at reduced power (3,000 rpm instead of the full 3400 rpm). Even with this "stretched out" take-off setting, the take-off was so short there was barely time to focus on the airspeed reading before being airborne. By the time the throttle was pushed forward and the wheel eased forward to lift the tail, the airplane was ready to fly—with a total take-off run of approximately 100 yards. There is no torque noticeable and casual direction from the cockpit produces a safe and effective take-off. Once off the ground, the airplane can be climbed steeply; in fact it requires a steep angle to keep down to the 80-mph climbing speed. Flaps are retracted in the climb with no sinking. On our

(*Continued on page* 31)

HELIO COURIER *is one airplane that can be climbed steeply immediately after take-off, and flaps can be retracted in the climb with no sinking. Climb speed is 80 mph*

by Jean H. DuBuque
Executive Director, NBAA

Honeywell Combines BUSINESS and TEST FLYING

Soon America's newest front-line jets will be equipped with electronic autopilots designed especially to meet the problems of supersonic flight. These new systems introduce to jet flying such radical concepts as control stick steering and flight path stabilization through control of such outer loop factors as altitude and Mach number.

Brand new to the Air Force, the concepts and the automatic pilot in which they are featured are already well known to a handful of pilots and engineers employed by NBAA-member Minneapolis-Honeywell Regulator Company.

For to them fell the job of developing and flight testing Honeywell's revolutionary E-10 autopilot.

Its recent acceptance by the Air Force marked another milestone in aeronautical engineering, design, test and production that the Minneapolis firm launched early in World War II. The program began when Honeywell, at the request of the Air Force, drew upon its long experience in the automatic control field and developed the aircraft industry's first electronic automatic pilot—the famed C-1 that was used on U. S. bombers during the war.

Coincident with the establishment of the Company's Aeronautical Division to produce the C-1, a flight operations section was set up at Wold-Chamberlain Field and Honeywell acquired its first business airplane—a Northrup *Delta*.

In the dozen-plus years since, Honeywell's Aero Division has grown until its six buildings and flight-test facilities sprawl over half a million square feet. Its engineering and test facilities are recognized as among the most advanced in the aircraft industry and its field service engineers can be found wherever Honeywell equipment flies.

Its 5,000 employees are engaged in the production of devices and complex systems—many of them electronic—designed to stabilize flight, measure and manage fuel, control engines, perform automatic landings, provide bombsight platforms, stabilize gun turrets and radar, guided missiles, and perform any other flight functions automatically.

By the end of World War II, Honeywell had produced 35,000 C-1 autopilots. In the years since, advanced models have been built for virtually every other type of bomber, fighter, helicopter, and guided missile. Moreover, its flight control activities have led it into the development and mass production of sensitive but rugged airborne gyroscopes, many of which are assembled in rooms cleaner than a hospital operating room. It is today a leading mass supplier of Hermetic Integrating or "HIG" floated gyro, described as the most precise aircraft instrument ever built.

Honeywell's interest in engine controls stems from World War II when turbosupercharger regulators gave new ceilings to wartime bombers. It now builds controls for late-model jet and propeller-driven engines.

Also during the 1941-45 period, Honeywell developed the first three-wire bridge capacitance fuel measurement system which put an end to "Model T" methods of fuel measurement in airplanes. Today, it is one of the industry's leading suppliers of electronic fuel-gauge systems, among them a new lightweight type that utilizes company-developed power transistors instead of vacuum tubes.

In addition to systems it supplies for a wide range of aeronautical applications, the company is a major supplier of such aircraft components as actuators, amplifiers, valves, switches, Mach sensors, accelerometers, etc. used in mechanical, electrical, hydraulic systems of planes today.

During this period, Honeywell's transport and flight test activities have grown, too. Its fleet now includes two DC-3's which have clocked more than 8,000 hours and have flown more than 1,300,000 miles without accident or injury to persons. Trips have been made to all parts of the United States,

(*Continued on page* 33)

EXECUTIVE DC-3, *owned and operated by Minneapolis-Honeywell, provides comfortable transportation for company officials on business flights throughout United States ,Canada*

Power Boost for the Bonanza

By Gordon Edwards

Executive Pilot

Bob Scarsdale, maintenance chief at Atlantic Aviation, Teterboro, had warned me before I taxied out.

"You know, Gordon" he said, "the prop governor is out while we are getting it set up for the E-225-8 engine. So, watch your RPM and boost on take-off and get it back fast. Anyway, you'll get a taste of things to come!"

I made the usual mental note to include this item in my take-off checklist and in a few seconds I was getting taxi clearance and runway info from "Teeter" Tower. *Bonanza* checklist is not too long and, for a change, traffic was not heavy. In less than three minutes I was cleared for takeoff.

Lining up on Runway 19 at the north taxiway intersection, I uncaged the gyro, leaned a little on the torque-side rudder and pushed the throttle smoothly to full position. Acceleration felt good but close to normal, feel of the controls came on rapidly and as the airspeed built up somewhat fast, I eased the elevator trim back, broke ground and hit the gear switch.

At that moment, it did not strike me that I was airborne before the Runway 6-24 intersection, a distance of less than 750 feet, nor that my nose was unusually high as I strove to keep the climbing airspeed to 100 Indicated! Normal habits assert themselves even in unusual situations and as I reached for throttle and prop switch, I sensed that things sounded and felt different. As I did so, my eye scanned the panel and collected figures that jolted me. Manifold pressure was over 28 inches, RPM was in the red line at 2700, airspeed was 115 despite my back pressure on the wheel and the altimeter was approaching 1,000 feet as I crossed the construction work at south end of runway.

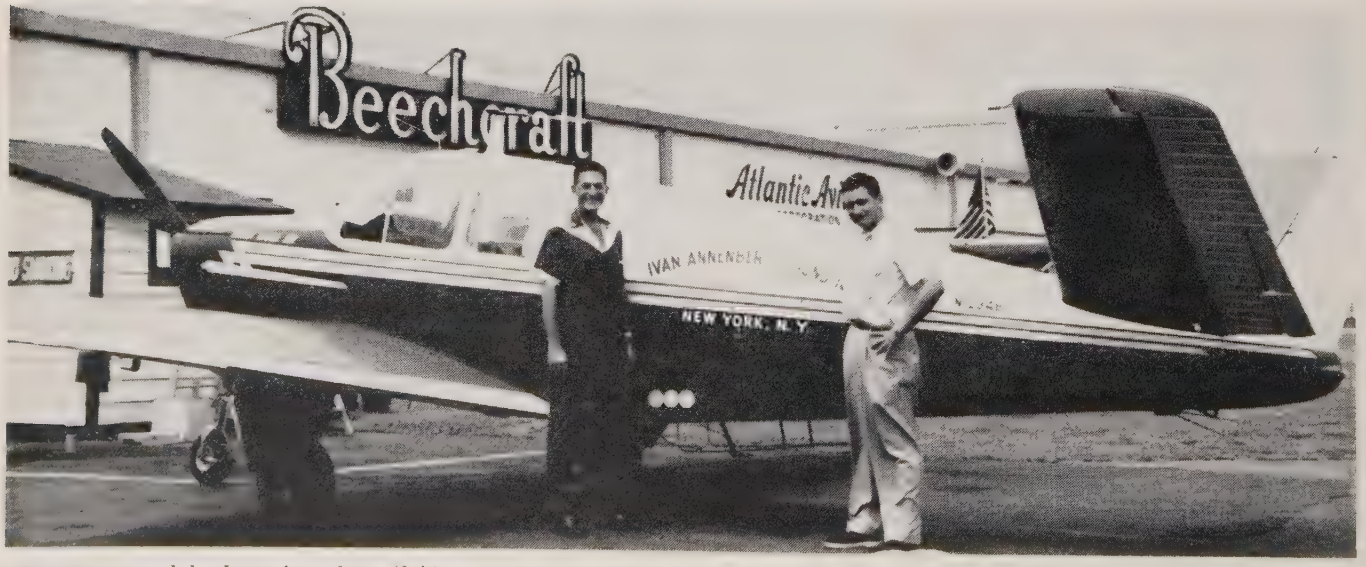
It was only a matter of a second or two before I had the throttle and prop back where they belonged and, having set up a normal climb-out configuration, I signed out with the tower. (Not without their kidding query, however, as to whether I had turned hot-rod!) If this was a taste of the 225 *Bonanza* performance, I wanted more of it.

For some time, Ivan Annenberg, businessman-pilot and long-time friend had been talking about the pros and cons of keeping his *Bonanza* "Baby Doll III" or turning her in on a new one of more power. Having flown with him and for him many years, my reaction was similar to his. I, too, felt that the performance differential of a new airplane did not outweigh the cost factor. And, like an old hat, one gets to love the feel of familiar things even with a car or an airplane.

Anyway, it was a complete surprise when Mr. "A," who uses the airplane heavily in his country-wide merchandising and distributing business, called me to say that, in lieu of the scheduled engine major overhaul, he had decided on the change to the Continental E-225-8 engine. As he pointed out, cost of the major overhaul, considering expected average of replacement parts and labor, came to almost the price of the exchange engine.

Again, it was easy to reflect that the extra power available for cruise as well as take-off could make up for the loss of performance we had sustained as a result of all the "garbage" (our term for the extra radio and instrumentation hardware hung out in the breeze) we had added to the plane.

Of course, we didn't talk at length of our practice of loading "Baby Doll" until the tail rested on the apron. How often have you seen *Bonanza* owners nonchalantly rest their shoulders *under* the butterfly tail-fin until their rearseat passengers are settled, and the copilot passenger *courteously* stands on the forward edge of the wing walkway while the pilot tip-toes gingerly up the step and wing to slide into his seat? So there be no misunderstanding, let me state that this paragon of postwar airplanes will carry almost anything you can



BONANZA *owned by Ivan Annenberg (left) recently had Continental E-225-8 engine installed. Tests have shown that in this installation, the engine runs smoothest at 2200 rpm and 20.5 inches manifold pressure; optimum cruise upped from 8,000 to 9,000 ft.*

stuff into it without exceeding gross weight, but the weight distribution and C.G. location when airborne and with the fourth person on the step on the ground are not the same. It's somewhat embarrassing to have to get out and lift the tail off the concrete a couple of times until the propblast holds it decently aloft!

Anyway, it was only a week later that Mr. "A" called to say that "Baby" was ready and would I like to make a week-long trip west and back to try her out? I would—and away we went!

A couple of years back when I had picked up "Baby Doll III" at the Beech factory, it had been exhilarating to plow my way home at 8,000 to 10,000 feet at an average TAS of 170-172 mph. It had been equally dismaying after all the laundry was hung out for "must" radio and instrumentation that experience has taught us to want (plus the auxiliary tank), to find that the average true airspeed was closer to 160 for practical VFR flight planning purposes. (For IFR we use 150 to take care of turbulence and built-in headwinds skillfully located for us by ATC at altitudes other than those we file, etc.)

Thus, it was that we looked forward to this trip with the 225 engine to supply a sort of rejuvenation sensation—and that it did.

We tried all ranges of the power-setting charts supplied with the E-225-8 engine, and found that at 2200 RPM and 20.5" manifold pressure, the engine ran smoothest, held a satisfactory head temperature, and true airspeed computation was in the order of 170 at 4,000 feet and up. (Note: For the reasons mentioned earlier, each airplane differs slightly. Airwork Corporation, of Millville, N. J., probably the biggest maintenance and engine concern handling these engines, supplies a cruise control and power chart with each engine and every owner can soon determine the best figures for his purposes.)

At altitude (we found optimum cruise was now at 9,000 to 10,000 feet instead of the earlier 8,000 feet), we couldn't get quite the power out of the engine that the chart called for but under favorable conditions with normal load, we varied from 165 to 175 true airspeed by adjusting the RPM and Manifold Pressure. At the higher figures, we burned 12 gals per hour, and it didn't fall off radically until we approached the lower figure. A very general conclusion might be that the E-225-8 engine can be operated very conservatively at the accustomed levels of the owner's previously installed 185 or 205-hp engine with resultant dividend in lower maintenance costs. Then, when desirable *or necessary*, the extra power of the 225 can be called on to provide top performance or added safety in an emergency situation.

As pointed out by Mr. W. E. Richards, Vice-President of Atlantic Aviation Corporation, largest Beechcraft distributor in the East, the 225-hp installation in the earlier model *Bonanzas* is not an approved Beech installation. At the present moment, there are only a few organizations in the country who are doing it on individual permission from the Aircraft Engineering branch offices of the CAA. In the future, there may be a blanket approval issued by the CAA.

Mr. David Dows, Jr., Assistant Service-Sales Manager of Airwork Corporation advises that the 225-hp engine can be installed on the "C" and "D" model *Bonanzas* without any basic changes, but earlier models must have a metal propeller and new-type fuel selector to be eligible for the E-225-8 engine.

Airwork makes available to all their top class dealers a complete schedule of the necessary data and approval information for selling this conversion job. As they point out, the maximum horsepower (225 at 2650 RPM at full [sea level] throttle) is available for take-off. Owners may use 165 hp continuously or may elect to use 185 hp continuously, in which case Airwork stipulates additional flight testing to check stability, controllability, stalls and control-system configuration is indicated.

No change in the fuel rating is necessary, 80 octane being the standard as before conversion. Oil temperatures are "in the green" up to 225°F and head temperatures may run 300 to 460°F with red-line at 525°F. Take-off RPM is 2,650, but the airplane may be operated continuously between 1750 and 2300 RPM which is the characteristic among others for which the *Bonanza* Continental engine installation is so beloved. It will run all day anywhere within that range and display no temperament or vibrational characteristics. (If for no other reason, more air-taxi outfits fly this single-engine airplane than any other!) Cruising performance and direct costs are so versatile that they may be tailored to fit any short- or long-

(*Continued on page* 34)

EXCERPTS FROM CRUISE CONTROL AND POWER CHARTS
(CONTINENTAL E-225-8)
(Beechcraft *Bonanza* 35, A35, B35, C35, D35)

SUGGESTED POWER SETTINGS (MANIFOLD PRESSURE)
(in inches of mercury)

ALTITUDE: 4,000 ft

2300 RPM	2100 RPM	1900 RPM	OAT	Brake HP
21.5	23.4			146
18.8	20.4	23.1	50°F	120
16.5	18.2	20.2		100
13.6	15.2	17.5		80

ALTITUDE: 8,000 ft

2300 RPM	2100 RPM	1900 RPM	OAT	Brake HP
19.5	21.4			146
16.8	18.2	20.7	0°F	120
14.8	16.1	18.2		100
12.7	13.9	15.7		80
20.3				146
17.5	19.0	21.6	20°F	120
15.3	16.7	18.8		100
13.2	14.4	16.2		80
21.2				146
18.4	19.9		50°F	120
16.0	17.5	19.7		100
13.8	15.1	17.0		80

TAKE-OFF—2650 RPM and Full Throttle
CLIMB—2300 RPM—not over 24 in.

DO NOT EXCEED—2300 RPM or 24" Maximum cruise.

HP	TRUE AIRSPEED Sea Level	4,000	8,000
146	176	180	184
120	163	169	175
100	150	155	159

FUEL CONSUMPTION

HP	RPM	GPH	Mi/Gal @ 8,000
146	2300	11.3	16.3
120	2100	9.8	17.8
100	1900	8.0	19.9

SKYWAYS' *discussion on crew coordination was attended by (left to right, standing) W. O. Davis of TWA; C. E. Koontz of the CAA, Washington; Don Baldwin, Chief Pilot for The Texas Co.; Lou Achitoff, Flight Safety, Inc.; Capt. E. J. Smith, Flight Mgr., United Air Lines; (left to right, seated) C. Maynard, Union Carbide; Bill Shaughnessy, Chief Pilot, American Cyanamid; Randy Carpenter, Flight Safety Foundation, who served as Moderator; Capt. J. F. Bledsoe, American Airlines; Robt. E. Porter, Chief Pilot, Shell Oil*

SKYWAYS FLIGHT OPERATIONS ROUND TABLE

SEPTEMBER 1955 *Wings Club, New York*

Problems in Crew Coordination

Moderator Rand Carpenter (*Mgr, Air Transport Div., Flight Safety Foundation*): "Crew coordination, the subject of this Round Table discussion, is particularly important because its successful achievement depends on the sum of two intangibles—judgment and the ability on the part of one person to adjust to the many and varied personalities with whom he may be required to fly. The duties or specific acts required of each crew member may be definable, but without smoothly functioning team-like precision these varied duties can become elements of a confused situation and lead to a possible accident.

"Capt. Bledsoe, would you give us some of your thoughts on this?"

Capt. J. F. Bledsoe (*Asst Supervisor, Flight Operations, American Air Lines*): "The problem of crew coordination might be divided in two parts: coordination between pilot and copilot, and coordination between pilot, copilot and flight engineer. On our twin-engine equipment, we divide the duties between just a pilot and copilot. Then, when the pilot and copilot become senior enough, they move up into four-engine equipment and operate with a flight engineer who absorbs much of the responsibility. In a sense this is done intentionally; with the flight engineer looking after the gauges, etc., the pilot and copilot can keep watch outside the cockpit. We want as many trained eyes as possible keeping watch.

"Crew coordination becomes important when pilots are called upon to fly both types of equipment, perhaps alternately. Years ago, when fall or winter happened around, a pilot and copilot were assigned to fly a type of aircraft and that crew remained together for the entire period. Later, however, operating procedures became standardized and this permitted an intermingling of crews.

"Our present-day program of promoting flight engineers to copilots is a step in the right direction. After all, a man who has been in the cockpit for a year or more is a better copilot than a new one. He is accustomed to working on the team and coordination has a head start."

Randy Carpenter: *"Lou Achitoff, you have had considerable experience in the business-flying field. Would you care to comment?"*

Louis Achitoff (*Asst to the Pres., Flight Safety, Inc.*): "As Capt. Bledsoe has pointed out, one of the most important factors in crew coordination is the division of duties in the cockpit. There should be clearly defined areas where both the pilot and copilot know exactly what they are to do and what they are responsible for individually. This is particularly important in cases of emergency when it is absolutely essential that you do not have several pairs of hands interfering with each other in the cockpit.

"One way to encourage coordination is to use check lists—and use them properly. The unplanned use of check lists does not accomplish any purpose, but if the pilot and copilot understand in advance who is to read the take-off check list, for example, or

ROUND TABLE PARTICIPANTS

RANDALL H. CARPENTER acted as Moderator of the meeting. U. of Del. graduate, served with ATC during World War II. Former Captain with American Airlines.

LOUIS ACHITOFF, assistant to the president of Flight Safety, Inc., holds an ATR and is Flight Examiner for DC-3, DC-4, etc., was flight test engineer for the CAA.

WM. E. SHAUGNESSY, JR., Chief Pilot for American Cyanamid Corp., joined that company as chief pilot in 1951. During war he was B-26 instructor for the Air Force.

CAPT. J. F. BLEDSOE, Assistant Supervisor Flight Operations, American Airlines, joined AA as copilot in 1936; was a captain in 1937; flew AA's ATC during war.

W. O. DAVIS, Flight Safety Specialist for Trans World Airlines, began his TWA career as ground radio operator in 1937. He became a flight radio operator in 1942.

D. A. BALDWIN became Chief Pilot of The Texas Company in 1948. He began flying when he was 16, attended Purdue, and was American Airlines Captain 1943-'46.

C. E. KOONTZ began his aviation career as a Navy pilot in 1940. He joined CAA in 1947 as Aviation Safety Agent 1st Region; transferred to Washington in 1951.

CAPT. E. J. SMITH joined United Air Lines in 1933 and was an airline captain until 1954. He is Flight Manager for United and is based at LaGuardia Airport.

LOUIS ACHITOFF, assistant to the president of Flight Safety, Inc., holds an ATR and is Flight Examiner DC-3, DC-4, Martin 202 and 404. Also is an aeronautical engr.

CHARLES W. MAYNARD, Manager of Union Carbide's Aviation Dept., joined company in 1952 to set up aviation department. Capt. Maynard is a former TWA pilot.

who is going to watch for traffic when they are coming in for a landing, then there should not be confusion and there will be coordination.

"As I mentioned previously, crew coordination is of particular importance in emergencies. Controlling the aircraft aloft, on heading, and on altitude is the responsibility of the captain. In the event of engine failure, after the captain has set up the airplane to either continue flight or to return, the copilot must determine from the emergency check list that everything is buttoned up properly, *i.e.*, fuel shut off on the inoperative engine, ignition off, cowl flaps adjusted, etc. In a situation such as this, the captain is not in any position to be reaching around the cockpit, especially if he's on an instrument approach. An understanding of the clearly defined duties of a pilot and copilot is vital to crew coordination. Let's not try to make a captain out of every copilot. Until a copilot becomes a captain, his duties basically are those of an assistant to the captain. He works in cooperation with him, anticipating his needs so as to reduce his load, thus making it easier to concentrate on flying the airplane."

C. E. Koontz (*Flight Operations Specialist, CAA*): "We of the CAA feel that the importance of good cockpit discipline in crew coordination cannot be over-emphasized. That fact, I believe, is apparent in view of the new domestic scheduled air carrier operating rules which require periodic training in emergency procedures. In the case of ditching or land evacuation, crew coordination becomes of utmost importance."

Randy Carpenter: *"In airline operation crew coordination can be defined pretty well, but in business-plane operation that may not be as easy to accomplish.*

"Don Baldwin, what do you think?"

D. A. Baldwin (*Chief Pilot, The Texas Company*): "Several years ago we started off on the basis that to have crew coordination you had to have two pilots flying the airplane, that is, as against a one-pilot-in-the-cockpit operation. Having two pilots in the business airplane simplifies crew coordination over that of the airlines because in a business-plane operation, those two men fly together continuously. A company may have two pilots or maybe eight or 10, but these men fly together continuously or with each other often. Thus, we are able to establish crew coordination that is nearly ideal, provided the proper training for crew coordination has been obtained.

"In our own organization, we train two men to fly an airplane, and our Operations Manuals are set up to establish the general duties of both a pilot and copilot. Also, we switch crews within the organization so that each pilot operates in the same manner. Then when we put two men together in the cockpit, each knows what the other is going to do and what is expected of him.

"Basically, crew coordination stems from a sound training program both on the ground and in the air. This training program should be supervised by a third party, preferably a completely disinterested party from outside your own organization. Perhaps in some cases in business flying, you are literally so close to the forest you can't see the trees. Consequently, crew coordination depends on the success of the outside training organizations supplying the know-how to the team in the cockpit."

Randy Carpenter: *"I think we all are in agreement on the necessity of training a crew as a team. However, there have been accidents caused by misunderstanding between crew members. Therefore, the question of prerogative inevitably comes up. In my opinion there must be no dilution of the captain's prerogative. On the other hand, there undoubtedly arises situations where a second pilot's taking decisive action, perhaps contrary to orders, is not only justifiable but also understandable.*

"Bill Shaughnessy, will you give us your thoughts on that?"

Wm. E. Shaughnessy, Jr. (*Chief Pilot, American Cyanamid Co.*): "Normally, business pilots operate with a slight advantage over the airlines in that we haven't the crew shifting that exists within the airlines. Perhaps that in itself helps to bring out the decisiveness of the captain's actions. There is no point in carrying a copilot if he isn't well trained and

"**UNDERSTANDING** *of clearly defined duties of pilot and copilot is vital to crew coordination," said Lou Achitoff (center) seated between Don Baldwin (left), Capt. Smith*

"**COPILOT** *must be able to take over in an emergency," said Bill Shaughnessy (right)*

if he isn't in a position to take over an airplane in the event of an emergency. To me, that is one of the prime reasons he is there."

Randy Carpenter: *"How would you feel about a situation, Bill, where a copilot in effect takes the airplane away from the captain and eventually demonstrates he was right, even though he actually had gone against the captain's prerogative?"*

Wm. E. Shaughnessy, Jr.: "If it is a case of the captain mishandling the airplane, it shows a pretty weak point. What we are interested in, of course, is getting the airplane back down on the ground.

"To answer you, Randy, I'd have to have more details of the specific instance."

Randy Carpenter: *"Then you feel that each such case would have to be judged on its individual merits?"*

Wm. E. Shaughnessy, Jr.: "Yes. Coming in on an instrument approach, the pilot flies the airplane—he stays on the gauges while the copilot keeps the outside watch and tells him when the field is contacted. The pilot continues on the gauges, and then the copilot handles the power and makes the actual landing. However, if the captain flew the approach and then tried to make the landing and the copilot saw that he wasn't picking up the runway, I think it would be normal for the copilot to take over. He'd say, 'I have the field in sight,' and then I'd release the airplane to him."

Randy Carpenter: *"I feel very strongly that the captain's prerogative must be maintained intact. However, there have been instances where, if a copilot had exercised what we would call good judgment, he would have taken over the airplane and presumably prevented an accident.*

"On the same subject, let's hear from Mr. Davis of TWA."

W. O. Davis (*Flight Safety Specialist, Trans World Airlines*): "It certainly would be hazardous in this business if we had situations where copilots could flower out as rugged individualists and start taking over airplanes whenever they thought it was justifiable.

"First of all, we have to start on the premise that responsible organizations are not going to put less qualified men in the cockpit as captains and superior men alongside them as copilots. The commander of the airplane is better qualified to do his job than anyone else. There may be individual cases where the man on the left blundered, but the operation as a whole, percentage-wise, is one of safety and efficiency. If we allow copilots to become rugged individualists, we're going to get into a lot of trouble. It always has been a policy in any operation requiring a multiplicity of personnel, that one commands and the others are supporters of that command. It would be hazardous to let that system break down now."

Randy Carpenter: *"A captain would be smart to let it be known that he would welcome the opinion or even the criticism under suitable circumstances of any copilot with whom he is flying. By so doing, the captain would have available to him what ever qualities of judgment and ability were inherent in the copilot."*

Charles W. Maynard (*Mgr., Aviation Dept., Union Carbide & Carbon Corp.*): "The Aviation Department of Union Carbide has a somewhat different approach to flight operations; instead of the usual flight crew set-up, we employ two captains and a flight engineer in each airplane.

At first it was felt that teaming two captains together might cause some difficulties, but it hasn't worked out that way. Our training program requires the entire crew to operate as a unit, and the program is flexible enough so that each crew can operate both types of aircraft used by the Corporation, Convair 340 and DC-3. This allows us to rotate our pilots, which makes it easier when vacations come around, and when one of our crew members is ill, our operation is not crippled.

"Using two captains, working as a team, has been our system for the past two and a half years, and thus far we have had no disturbing factors either in the cockpit or out. Two captains can operate together efficiently if each is open-minded. In our operation, one pilot acts as captain on an assigned flight, while the other acts as copilot. Both pilots are given about equal time as captain and first officer. Through this system, we feel that the pilot who is assigned as captain has a marked advantage in that on his previous trip he served as copilot and took care of navigation, radio communications, etc. Having two pilots thoroughly checked out in all phases of operation, with respect to aircraft and Corporation requirements, gives us a highly specialized crew.

"The flight engineer that we carry has a multiplicity of duties. He takes care of daily inspection forms on the aircraft, submitting them to the captain for signature. He is responsible for the gassing and oiling of the aircraft and the collection of gas tickets. While aboard, he sets the power, keeps the aircraft engine log, and serves as cabin attendant. While away from home base, he is in charge of getting the necessary repairs done as well as securing the aircraft at the end of the day's operation.

"Having a flight engineer aboard on all flights has proved to be of great value when aircraft repairs have had to be made, because he has a thorough knowledge of the engines and accessories in our particular configuration

In the Convair, the flight engineer makes frequent observations of the engine analyzer and thereby reduces the possibility of engine failure by locating difficulties while they are in the incipient stage.

"I can see where having two captains together might not be good in regular airline operation, especially if you were to have a senior captain in the righthand seat and a junior captain in the left. Most airlines have a definite chain of command, with the captain the head of the chain. Also, in the airline type of operation there are a large number of pilots in training to become captains, and this eliminates any possibility of flying two captains together, for the most part at least. In our operation, however, I am happy to report that the two-captain team is working out very well."

Capt. E. J. Smith (*Flight Mgr., United AirLines*): "About six months ago, United put into effect a set rule that on hood checks we do not take two captains at one time. We take a captain and a first officer, but not two captains. If an expiration deadline problem arises and we have to take two captains, then while one captain flies the left hand seat the other one stays in the cabin during the check ride. One important reason for this is that if a captain who is being checked shows up a weak point, we don't particularly want the other captain to see it. Also, if there are two captains in the cockpit, there might be a tendency for them to joke around, particularly if they are good friends, and we want to eliminate these little discrepancies. Therefore, we have a set rule that under no condition will two captains go together on a flight check.

"On this problem of when does a copilot have a right to speak out or to take the controls away from a captain, there actually is no blanket rule. Just for a minute, however, let's set up a so-called Board of Hearing. Let's say that the captain is at the controls and the copilot or first officer sees an on-coming aircraft. The copilot takes evasive action possibly because he knows he wouldn't have time to call the captain's attention to it. In another instance, takeoff, for example, let's say the captain is taking off and at just about V_1 speed an engine begins to act up. In his own mind the captain wants to continue the take-off but the first officer says, 'Abide by the rules,' and decides the takeoff should be voided, and so pulls back on the throttles. Now we have two situations here: one in which the copilot maintains he hadn't time to call the pilot's attention to the need for evasive action, and the second, in which I feel the copilot had no right whatsoever to touch the throttles. In this second instance the captain took everything into consideration: his take-off roll, his gross weight, runway length, etc., and elected to continue the take-off.

"In both instances, the decision on what was the right thing to do is based on the individual merits of each action. There can be no blanket rule."

Wm. E. Shaughnessy, Jr.: "About the last thing I say to a copilot when I begin an instrument approach is, 'if you see anything on this approach that you don't like, you take over.' One man does the flying and when the other man establishes contact, you give the controls over to him. You respect his judgment."

Don Baldwin: "Regarding your question, 'Should a copilot question what the pilot is going to do?,' don't you think crew coordination in itself makes every movement within the cockpit by either crew member a questioning factor? If a radio is tuned, we require our copilots to call out the station being tuned and it must be identified and checked. In a procedure turn we require whomever is flying to call out the procedure turn altitude and the other pilot confirms it. In effect, everything that is going on in the cockpit is checked and double-checked. In this way, the two men in the cockpit make up a coordinated team."

Randy Carpenter: "*In a situation like that it would be practically impossible to have a misunderstanding.*

"*Mr. Porter, what are your thoughts on this, with regard to training?*"

Robert E. Porter (*Chief Pilot, Shell Oil Co.*): "Our problem is somewhat different in that our airplanes are relatively small, the DC-3 being the largest. We have practically no crew rotation; our pilots and copilots fly together in their own areas and seldom interchange. We try to give our captains almost 100% responsibility and we do not define the copilot's responsibilities. We leave that up to the crews themselves to work out according to their operation, the planes they have, the individual conditions, etc. Because we have as well qualified captains as we can get, we let them do the whole job of crew coordination. In most cases, our copilots also are mechanics.

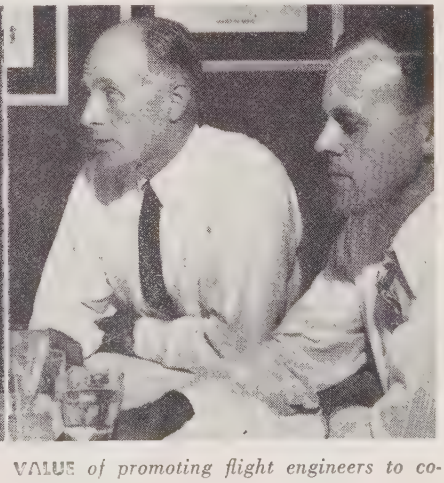
"As far as training is concerned, we start out by selecting well-qualified men. Secondly, after publishing training minimums in our Flight Operations Manual, we allow them to design, as much as we can, their own training curriculum, using the facilities that are open to them. I visit the locations where these pilots are based and act as liaison, carrying good ideas from one location to another.

"Our captains understand that everything is their responsibility. Under emergency conditions on both single and multi-engine equipment, we want our captains to be able to handle the emergency alone, but at the same time we want close coordination between the captain and his copilot. Each must know what he is going to do in the event of an emergency."

(*Continued on page* 34)

"IMPORTANCE *of cockpit discipline cannot be over-emphasized," said C. E. Koontz (left)*

"COPILOTS *must not become rugged individualists in cockpit," said W. O. Davis*



VALUE *of promoting flight engineers to copilots was suggested by Capt. Bledsoe (left)*

SKYWAYS FOR BUSINESS

News Notes for Pilots, Plane Owners Operating Aircraft in the Interest of Business

AERO COMMANDER *Model 560A features improved streamlining of engine nacelles which now completely house augmentor tubes; another feature is 10 inches added to cabin*

New Model Aero Commander For Business Flying Market

Bethany, Okla. The new model Aero *Commander,* twin-engine business plane, features a longer and roomier cabin than predecessor models, and has been designated 560A. The most outstanding visual feature of the 560A is its redesigned nacelles which completely house the augmentor tubes within their clean unbroken lines.

In adding 10 inches to the cabin of the *Commander,* additional custom interior arrangements have been made possible, among them (as optional equipment) the installation of a hassock-chair which may be used to replace the center seats. These chairs have fold-down backs and both fore and aft sides, permitting the formation of either a full-length lounge or a restful chaise longue. The hassock-chairs also may be fitted for use as an ice box or a chemical toilet. Tuckaway tables available also.

Power for the *Commander* is provided by two GO-480-D1A Lycoming engines, each rated at 275 hp. As a result of the increase in horsepower and the improved streamlining of the nacelles and cabin, the Model 560A has an optimum cruise of 204 mph and a high speed of 211 mph.

AiResearch Aviation Installs Madsen Lights on Executive DC-3

Los Angeles, Calif. A new system of exterior lighting for DC-3 aircraft which lessens chances of mid-air collision by brightly indicating the aircraft's direction of movement, position and altitude, is now available to owners of business DC-3's.

The new type of illumination consists of seven hi-intensity flashtubes mounted on the top and bottom of the aft fuselage, flashing in a rapid aft-to-forward sequence. These lights, which are easily visible for several thousand feet even in daylight, flash for 1/1000 of a second at 1/16 of a second intervals and give the illusion of brilliant white "lines" moving across the sky in the same direction as the plane itself. The size of the space between the "lines" indicates the distance of the aircraft from the observer.

The weight of the entire Madsen Lights DC-3 installation, including transformer, rectifier, condenser, and wiring and fixtures, is approximately 10 pounds. The light system is named after its inventor, Capt. Andrew Madsen, a Transocean Air Lines pilot. The Madsen Lights have been tested and CAA-approved for DC-3 aircraft. Initial testing was done on a Morris-Knudsen company-owned DC-3.

Kewanee Oil Co. DC-3 Gets Outer Wing Tanks

Reading, Pa. By installing tanks in the outer wing panels of a DC-3, Reading Aviation Service has upped the Kewanee Oil Company DC-3's gas capacity by some 400 gallons. In making the installation, some rework had to be done to the 3's outer wing panels. The original webbing was removed and six new reinforced formers were installed. When installed, the tanks fit snugly into the tapered holes of these formers and were secured to the structure at the inboard end. The filler neck of each tank was flushed-in with the top side of the wing. Under normal conditions each engine draws gas from its respective tank, *i.e.,* the left engine from the left auxiliary tank and the right engine from the right auxiliary tank.

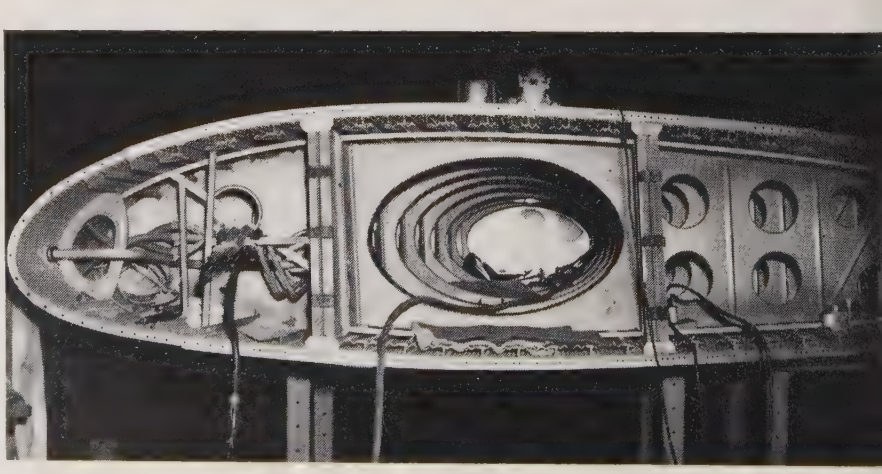
Flight characteristics of the business DC-3 remain the same, according to Kewanee's Capt. Skip Wittner in whose airplane the installation was made. "That added four hundred gallons of gas dispels all fears of fuel shortage on long IFR flights," Capt. Wittner stated.

Executive Flyers, Inc., to Lease Business Aircraft

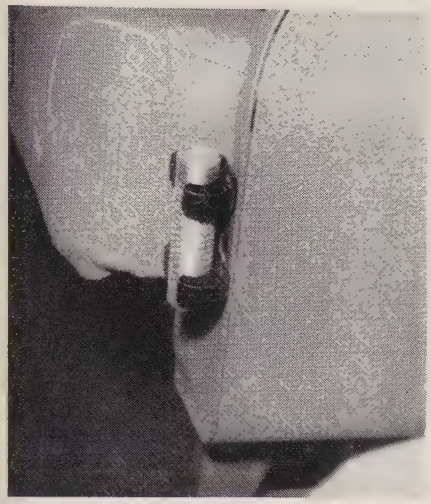
Dallas, Tex. Three veteran Dallas airmen have organized a company to offer business concerns the per-hour use of single- and multi-engine aircraft, complete with crews. Based at Southwest Airmotive, Love Field, Dallas, Executive Flyers, Inc., is owned by Col. D. H. Byrd, Robert A. Lyle, for the past nine years Col. Byrd's chief pilot and Charles R. Pate, Jr., also formerly a member of the Byrd Oil Corp. air crew.

EF plans a continuing expansion of its initial pool of six aircraft, with crews making them instantly available through a lease agreement with corporations which occasionally or regularly need planes but do not wish to incur the expense of purchasing their own and paying crew salaries, hangar rentals and maintenance costs.

All flights will be made in finely maintained aircraft, in strict conformity with CAA regulations. Executive Flyers' aircraft now available include two deluxe,



GAS FUEL TANK *installation in outer wing panels of Kewanee Oil's DC-3 required removal of the original webbing and the installation of six new reinforced former*



METAL CONTAINER *containing hydro-carbon "P-6" eliminates odors in aircraft cabin*

twin-engine Lockheed *Lodestars*, a Beech Twin Bonanza, two single-engine *Bonanzas* and a single-engine *Navion*. The pilots are CAA-certificated veterans with thousands of hours at the controls of airline and executive aircraft.

New Device Eliminates Cooking, Tobacco Odors in Air Transports

New York, N.Y. A revolutionary new scientific device has been perfected by Dr. Walter L. Phillips of Phillips Scientific Laboratories, Newark, N.J., which will eliminate all tobacco and cooking odors on board air transports, and prevent airsickness and nausea. Called "P-6," it is a non-toxic and non-irritating hydrocarbon chemical that disintegrates odors as they form. It also chemically precipitates the vapor pressure inside an aircraft, thus preventing nausea and flight fatigue.

P-6 containers, about one inch in diameter and four inches long, are attached below the transport's seats, on alternate rows, and extra containers may be placed in the flight galley, washroom and crew compartment. The containers are dust- and dirt-proof, and are replaced after every flight.

Swissair is installing P-6 on all its aircraft, and as a result cigar-smoking actually will be encouraged on Swissair flights.

Learstar Executive Transport Makes Transatlantic Flight

Santa Monica, Calif. A *Learstar* executive transport flew 2,570 miles non-stop from Gander, Newfoundland, to Paris recently in just eight hours, 50 minutes.

The *Learstar* was one delivered to its owner, Charles B. Wrightsman, a Florida executive with international oil interests, last June and was equipped by Lear for maximum efficiency in communications, navigation and automatic control in global operations. Included in the equipment was a Bendix Polar Path Compass.

The cruise altitude for the Wrightsman *Learstar* on the long over-water flight was 9,000 feet.

. . . in the business hangar

Automobile Carriers' Bruce Hallock brought his company's de Havilland *Dove* to Dallas Aero Service for installation of two overhauled *Gypsy 70-Mark 11* engines. Dallas Aero also performed an annual inspection. Home base for the Automobile Carriers, Inc. *Dove* is Flint, Mich.

The Beechcraft C-50 owned by the J. B. Michael Co., Inc. recently was equipped with a Flite-Tronics MB-3 marker receiver and a CA-1 audio amplifier. Installation was made by Anderson Air Activities at Memphis, Tenn.

United Manufacturing Co., Chicago, has added a Model 47G Bell helicopter to its fleet of company aircraft. The copter is based at Denver's Sky Ranch Airport and is being used by company engineers and geophysicists for testing United's line of uranium-detection instruments.

Earl Johnson brought Storer Broadcasting Company's Super-92 DC-3 to Remmert-Werner for installation of long-range outer wing tanks, a double engine change, relicense, and installation of a Sperry A-12 autopilot and a Bendix RDR Airborne Radar. In addition to being Storer's chief pilot, Mr. Johnson is his company's NBAA representative. Home base is Birmingham, Mich.

Phillips Petroleum Company's DC-3 has been in the shop at Dallas Aero Service for an engine change.

The *Lodestar* belonging to Fletcher Oil and Gas Company is flying again after 100-hour check by Southwest Airmotive.

N. L. Ledbetter and Jim Wheeler brought Seaboard Oil Company's DC-3 to Executive Aircraft Service for 100-hour inspection, left engine change and miscellaneous repairs.

J. D. Reed Co., Inc., Houston, Texas, has equipped its own Beech E18S with a Flite-Tronics MB-3 marker beacon receiver. Atlantic Aviation Service, Wilmington, Del., also installed an MB-3 in its C-50 Beech.

Lea Dorrance and Sonny Harrison have been in St. Louis while Gaylord Container Corporation's DC-3 was being equipped with a Bendix RDR Airborne Radar. Installed at the same time were an ARC-1 50-channel VHF transceiver and two Wright R-1820-56 engines. Lea is Gaylord's NBAA representative.

A 65-gallon auxiliary fuel tank was installed in William F. Carr's de Havilland *Dove* by Dallas Aero Service. Corpus Christi is home base for the *Dove*.

Dave Boswell, pilot for Mobile' International Paper Company, brought his company's Twin Beech to Southwest Airmotive for a single engine change and 100-hour check.

Ed Fear, chief pilot for Airnews, Inc., San Antonio, brought his company's DC-3 to Executive Aircraft Service for a new interior installation, an "Airstair" door and special systems.

Bob Barrett, maintenance representative for Milner Enterprises of Jackson, Miss., stayed with his company's Lockheed *Lodestar* while it was at Dallas Aero Service for a double engine change.

Owens-Illinois Glass Company's Twin Beech was at Remmert-Werner, Toledo, for installation of two ARC 15D omni receivers with new 16076 combination indicators. Dick Whitbeck is O-I's chief pilot; T. Kaatz is O-I's NBAA rep.

Colorado Interstate Gas Company of Colorado Springs, and Pipeline Construction and Drilling Company of Camp Hill, Pa., recently took delivery of new Bell Model 47G-2 helicopters. Both 'copters went to work immediately on pipeline patrol.

Tom Neyland, pilot for Delhi Taylor, brought the company *Lodestar* to Southwest Airmotive for 100-hour check.

Mayfair Minerals' Super-92 DC-3 has been at Remmert-Werner, St. Louis, for annual inspection and a double engine change. John Jordan, Mayfair's pilot, reported that after 951 hours at between 655 and 680 hp, his Super-92 engines averaged 51 gallons of gas per hour and one to two quarts of oil each.

The DC-3 operated jointly by Bendix Corporation and the Eclipse-Pioneer Division was at Dallas Avionics for engineering and fabrication of a complete custom panel. Dallas Avionics also has had Continental Oil's DC-3 in for a 100-hour radio inspection. Both Continental Oil and Bendix are members of the National Business Aircraft Association.

Official NBAA Report

NATIONAL BUSINESS AIRCRAFT ASSOCIATION, INC.

(formerly Corporation Aircraft Owners Association)

National Business Aircraft Association, Inc. is a non-profit organization designed to promote the aviation interests of the member firms, to protect those interests from discriminating legislation by Federal, State or Municipal agencies, to enable business aircraft owners to be represented as a united front in all matters where organized action is necessary to bring about improvements in aircraft equipment and service, and to further the cause of safety and economy of operation. NBAA National Headquarters are located at 1701 K Street, N. W. Suite 204, Washington 6, D.C. Phone: National 8-0804.

Annual NBAA Meeting of Vital Interest to Business-Plane Owners

It's just a little less than one month until NBAA will hold its Eighth Annual Meeting and Forum in Detroit, Michigan, at the Sheraton-Cadillac Hotel. In the event your calendar isn't already marked, take time out now to circle October 5, 6 and 7.

This annual convention will be unique in the annals of NBAA history . . . so much so that our Board of Directors and Convention Committee believe no one interested in the many facets of business flying can afford to miss the opportunity of attending.

The program will have as its general theme, "Administration, Maintenance and Operations (AMO)" focused toward "Maximum Margin of Safety." Forum discussions will be devoted to crucial current problems in business-aircraft operations with experts covering such subjects as pilot training programs, flight safety, weight control, maintenance policies and procedures, limitations of piston-engine aircraft and the future use of turbo, turbojet and jet-powered business aircraft, air navigation and air traffic control, weather services, community airport planning for business-aircraft operators, airport service problems, and many other topics of vital interest to you and your company. Also, there will be our all-important annual company and member-pilot safety awards, outstanding social events, prominent speakers, industry exhibits, attendance prizes, a grand prize to be awarded at the Annual Banquet and Honors Night, and other special attractions.

Members of NBAA's Detroit Convention Arrangements Committee include Robert J. (Bob) Kusse, Chairman (Fruehauf Trailer Co.); Larry Zygmunt, Vice Chairman (General Aircraft Supply Corp.); Associate Chairmen: B. J. (Bob) Bergeson, Finance (Ford Motor Co.); Tilson Peabody, Program (General Motors Corps.); Allen (Al) H. Rhodes, Transportation (National Automotive Fibres, Inc.), and Robert Anderson, Exhibits (Anderson Aircraft Radio).

CAA Replies to NBAA Query Re: Two-way Radio Failure

NBAA recently checked with CAA officials concerning two-way radio communications failure procedures associated with the use of short-range clearances. Following is the text of the CAA letter which should prove of interest to all business-aircraft operators:

"The radio failure procedures contained in Civil Aeronautics Manual 60, effective April 15, 1955, were rewritten to more clearly outline pilot action under various conditions. This same information will be included in the next edition of the Flight Information Manual which was available August 1, 1955.

> 'If the pilot has received and acknowledged a clearance to a point other than the destination airport or the radio facility serving the destination airport and holding instructions have not been received, he shall continue flight at the altitude(s) last assigned by Air Traffic Control or the minimum instrument altitude, whichever is the higher, to the radio facility serving the destination airport.'

"In conjunction with the foregoing, a pilot is expected to continue to the radio facility serving the destination airport on the route specified in the air traffic clearance and/or the route filed in his flight plane. To elaborate further, two situations may apply; *i.e.*, the clearance limit may or may not be on the flight-planned route. Assuming that it is, and failure occurs prior to or upon reaching the clearance limit, the pilot should follow the route specified in the clearance to that point and then proceed via the flight-planned route or merely proceed via the latter, as appropriate. If the clearance limit is not on the filed route, the clearance should contain routing information beyond the clearance limit either to the destination airport or to some point on the filed route. In this case, a pilot experiencing two-way radio communications failure should follow the route contained in the clearance to the radio facility serving the destination airport or to the limit of such routing, thence via the flight-planned route to such radio facility.

"Short-range clearances have been used primarily at locations exercising radar departure control and provision is made in the Radar Manual for including routing information beyond the clearance limit when this point is not on the route of flight filed by the pilot. Recently, however, some facilities not providing radar departure control service have adopted the short-range clearance procedure and apparently are not furnishing this routing information. We propose, therefore, to issue appropriate instructions in this regard immediately to our field personnel and to include such instructions in a future revision to the ANC Procedures for the Control of Air Traffic Manual. In addition, for the benefit of pilots concerned and to insure a common understanding of the procedures to be followed, we shall incorporate pertinent portions of the above information in the Flight Information Manual and possibly in Civil Aeronautics Manual 60."

French Institute of Navigation Comments on U.S. Policy Reversal

Following is a copy of a recent translation of an article from "*Navigation*," April 1955 issue, dealing with the reaction of the French to the VOR/DME issue. "Navigation" is the quarterly publication of the French Institute of Navigation.

In transmitting this document to you, NBAA points out that the significance thereof should neither be exaggerated nor minimized. In other words, it represents the reaction of technicians in one major country, and there is a reasonable possibility that this feeling may be shared by others. Following is the translation of the article entitled, "A Sensational Reversal of American Policy Regarding Radio Air Navigation Aids."

"Quite recently, on February 9, 1955, air navigation circles were taken by surprise on reading an article in an American publication which had the effect of throwing confusion into the various plans and programs of air navigation equipment engineers and manufacturers.

"This article dealt with nothing less than the selection, on short notice, of an air navigation aid system to replace the VOR/DME combination which we thought had been fully established on the other side of the ocean.

"Apparently, after a long controversy—some would call it a quarrel—the ANDB bowed without enthusiasm before the decision of the military authorities who were advocating the early adaptation to current civil aviation needs of the military system called TACAN which is classified. It was intended that this would be accomplished first by concentrating on the improvement of TACAN in such frequency bands as are presently open, and then by permitting the use of DME for a period of time which might run until June 30, 1955, and of VOR until 1956, the purpose being to free certain frequency bands.

"Strangely enough, the resolution of the ANDB included an alternate course of action in case TACAN should fail. This alternate course of action envisaged, for azimuth indication, a CW omni-directional system operating on frequencies higher than those of the present VOR, with the present DME remaining available for distance indication.

"The ANDB explains its acquiescence

to the military decision by making the following criticism of the VOR/DME system:

"Present VOR is accurate only within three degrees, whereas TACAN provides azimuthal precision to nearly one degree. VOR does not meet installation requirements satisfactorily, particularly aboard aircraft carriers.'

"However, in announcing its decision, the ANDB emphasizes that there still remains a number of unsolved problems in the process of developing TACAN, and that numerous questions are yet to be answered in connection with the allocation of frequency bands and the standardization of a system designed to be used by both the civil and the military and probably intended for international adoption.

"According to the ANDB decision DME would no longer be guaranteed for civil aviation needs after June 30, 1955. VOR, however, would be provided until 1965.

"Reactions of interested organizations and manufacturers will soon be known, and these will apparently include the outcome of an appeal to U. S. Congress.

"What now shall we say of the uncertainty and confusion among European users and manufacturers? They were still dreaming of a single system in the belief that, by acquiescing to the adoption of VOR/DME, they had satisfied the requirements of Atlantic solidarity and had given evidence of the most commendable goodwill. Where will the directives come from now, and how long will they stand?"

Although many developments have occured in this controversy as previously reported in the July issue of *SKYWAYS*, it was believed that the Gallic view on the subject would be of interest.

First DME Instrument Approach Procedures Established by CAA

DME-equipped aircraft now are permitted to make instrument approaches (effective on August 23) as a result of an amendment to CAR Part 609 adopted by CAA, establishing criteria and procedures which will permit straight-in approaches based on DME information.

Purpose of the CAA amendment was to integrate DME into VOR procedures "to facilitate an instrument approach along an orbit and/or radial established by a VOR/DME facility."

Two specific procedures set up are: 1) VOR/DME approach established from the facility direct to the airport or to a runway if a straight-in approach is possible; and 2) an approach from a DME fix along the radial which passes over the airport or runway, and the flight is conducted toward the facility. The amendment notes that other orbiting procedures "may be established in addition to the above if operationally feasible and if such orbiting procedures will provide straight-in approaches to desired runways."

Maximum length of the final approach orbit in degrees in relation to runway distances is 1) 135° for distance of five nautical miles or less; 2) 120° between five and 10 nautical miles; 3) 105° between 10 and 15 nautical miles; and 4) 90° over 15 nautical miles.

"Orbiting procedures will not normally be established with less than an *arc of four nautical miles radius*," CAA states. "Normally, the fix at the start of the DME approach orbit will be at least four nautical miles from the approach end of the runway. When a DME fix is used to afford a reduction in altitude and/or to provide information as having passed an obstruction, the DME fix will be established at least 1½ miles beyond the obstruction or 10% of the distance to the facility, whichever is greater."

Minimum lateral obstruction clearance of two nautical miles on each side of the final approach of DME orbit lying between DME fix and approach end of desired runway has been established as follows: *Seven nautical miles and less*, a clearance of 300 feet; *seven to 10* nautical miles, a clearance of 400 feet; *10 to 12* nautical miles, 500 feet, *more than 12*, 1,000 feet.

Amendment requires that DME airborne interrogators be accurate within 3% of distance or plus/minus ½ mile, whichever is greater in order to utilize procedures.

NBAA was informed by a CAA spokesman that some 50 airports could use the new straight-in DME approaches for the first three to four months after the effective date, with about 150 to be added shortly.

NBAA Member Designs Jet As Business Transport

A light jet transport plane that will cruise at 560 mph is on the drawing boards of NBAA member, Fairchild Engine & Airplane Company, Hagerstown, Maryland.

The new plane, designated the M-225, is designed as a business transport or for military use as a transport and transitional training plane.

If enough interest is shown by business customers, it will be put into production.

The plane, a low-wing transport, will carry a crew of two and seven passengers. It will be powered by four jet engines. Exact type of engine has not yet been determined, according to the aircraft division. There is a possibility that a new jet engine under development by Fairchild may be used.

Specifications show a wing span of 35 feet 4 inches; length, 50 feet 10 inches, and height 13 feet 3 inches. Normal gross weight is 17,695 pounds. The jet would take off at 17,695 pounds within 5,720 feet over a 50-foot obstacle. It can land in 1,222 feet.

The proposed jet's speed would far exceed that of the fastest available business transports, which is about 300 mph, according to the division.

Long-runway requirements would restrict the jet to major city airports.

ACC Requests CAA Plan Evaluation of Integration of Air Defense, ATC

The Air Coordinating Committee has requested the CAA to develop a proposal for the earliest possible large-scale service evaluation of a first stage integration of air defense and air traffic control.

The committee recommended that CAA collaborate with the Lincoln Laboratories in order to facilitate the coordination with research and development efforts.

The resources of the Air Coordinating Committee, Air Traffic Control and Navigation Panel, and anything else that will be useful to CAA in furthering a solution to this problem are made available to it.

The committee also recommended that CAA obtain the full coordination and cooperation of the Department of Defense and the Air Navigation Development Board, etc. in developing the proposed plan.

The committee established August 1 of this year as the deadline for submission of such plan to the Air Coordinating Committee for policy action regarding actual implementation. Committee agreed plan submitted should be as detailed and specific as possible in this time limit.

(*Continued on page* 38)

FAIRCHILD'S *proposed light jet business transport is shown here in artist's conception. Designated M-225, the transport will carry crew of two and seven passengers and was designed to be powered by four Fairchild jet engines; will cruise at 560 mph*

FUELS-OILS

Features and Facts Pertinent to Successful Flight Operations

SHELL OIL *has been primary engine oil and fuel supplier for the French MS-760, currently on a nation-wide tour sponsored by Beech Aircraft Corp. MS-760 uses kerosene*

Fuel For Private Jet Planes Promised in Shell Announcement

Despite the high and enthusiastic interest expressed by potential customers when they got a good look, recently, at the MS-760, four-place, twin-engine, personal jet, one worry kept nagging some of them. Where, they wondered, would a jet owner get fuel for this racy, 410-mph French plane?

Some rumors, as Beach Aircraft Corp. demonstrated the wonder ship, had it that the engines could be "converted" to operate on high octane avgas. Common-sense soon knocked that one out when the relative instability of the avgas at the stress and strain level of jet-engine operation was considered.

For anyone concerned about the matter, however, there was good news on the way. Now it has been announced that just as soon as there is demand for special fuels and oils for personal jets, Shell Oil Co. has promised there will be adequate Shell supplies on hand through airport dealers throughout the country.

In making the promise to future jet owners, J. S. Harris, Shell's aviation manager, pointed out that Shell was, in fact, the primary fuel and oil supplier for the tour of the French jet plane.

(Supply of the fuel and oil for the jet plane demonstration tour may remind some of other Shell efforts to boost new fuel fields. When General Motors was testing its now-famous Kettering Engine, for instance, Shell set up special fueling points all over the country. Too, Shell has made a specialty of taking entire service centers to the scenes of sports car races. In the supplying of the jet plane, in some instances, Shell's "logistics" department had to operate with virtually stop-watch timing to make sure that fuel, properly handled and ready, was on hand as the jet touched down or got ready to zoom off.)

Shell's part in the tour, as a matter of fact, was doubly significant. Not only was it a good basis for the announcement about future supplies but it showed an on-the-spot and practical flight example of a certain versatility in the jet engines of the French plane. For, during the tour, the engines burned the kerosene-type fuel now being supplied by Shell to the turboprop *Viscounts* of Capitol Airlines.

This fuel, especially refined so that, for instance, it flows freely at 40° below zero, presumably is at least a bit different from the fuels first fed the plane in France. Operation, however, was fine.

Shell's new network of supply that will feed some 150,000,000 gallons of the kerosene-type fuel to Capitol in the next three years, is, of course, a natural basis for its promised future handling of private jet demands.

For one thing Shell already has put new, special handling equipment for the jet-type fuel into each of the airports on Capitol's *Viscount* route in this country.

Twin storage tanks, both-end filters through which the fuel passes when going into underground storage tanks and through which it passes when leaving storage, and special tank trucks for delivering the fuel to the plane have been provided. Too, Shell has down to routine practice, the special handling needed to assure "bone dry" delivery of the jet-type fuels.

The point behind this is that water in kerosene-type fuels settles out at a much slower rate than from the gasoline types such as JP-4. Shell has made certain that proper settling times are always allowed for, and that factor has become simply no problem at all, their technicians report.

All of this sort of experience, however, is more and stronger backbone for their private jet fuel announcement—an announcement which, happily, has removed the bad-dream dilemma of a man buying a $300,000 private jet plane, gaily taking off for a maiden flight and then discovering that the only place he can go is right back home again because only there is fuel available.

Liquidometer Tank Indicator Given Airport Storage Role

Liquidometer Corp.'s new Model 216 Remote Reading Tank Contents Indicator has been found to be ideally suited for airport storage tanks, either buried or above ground, wherever remote indication of fuel quantity is required, according to a spokesman for Long Island City, N.Y., company.

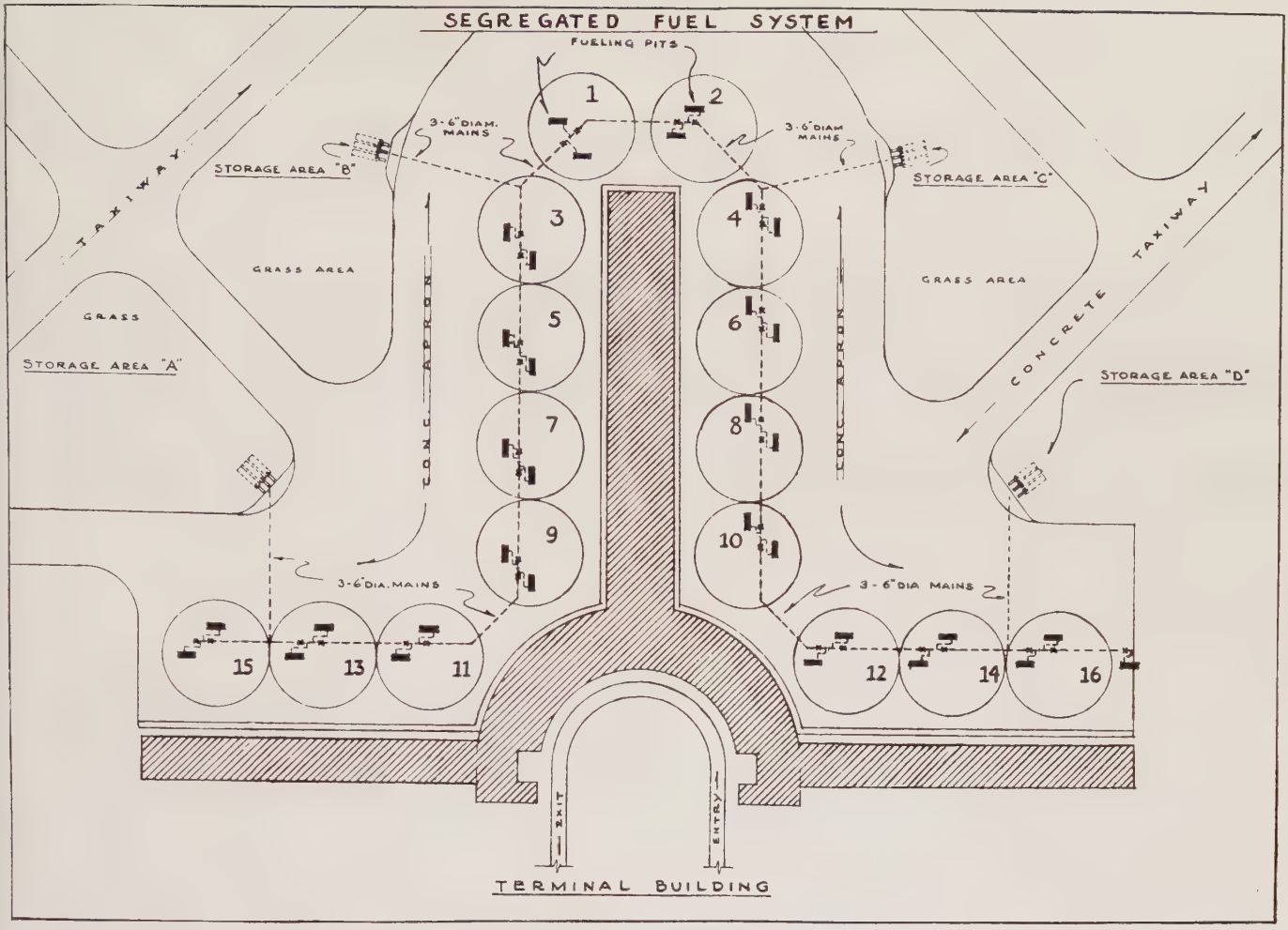
Liquidometer also manufactures Dial-Type Direct Reading Tank Contents Gauges for airport fuel storage tanks where the indication is required at the tank site.

The new Model 216 Remote Reading Tank Contents Indicator was especially designed for situations in which panel space is limited.

A dial-type instrument, it has a scale length of 20 inches although occupying a panel space of only 3 x 10¼ inches. It is available for either horizontal or vertical panel mounting, to add versatility of placement to its relatively compact size.

The Model 216 is to be used with Liquidometer's automatic hydraulic tank

LIQUIDOMETER *Model 216 Tank Indicator is remote-reading device for airports*



contents gauging systems. These systems, with which many operators are familiar, are approved by the Underwriters Laboratory for gauging hazardous liquids and are available for many corrosive as well as non-corrosive liquids and for tank pressures up to 200 pounds per square inch.

The gauging system consists of an indicator and a float-type tank unit interconnected by a flexible conduit containing two hydraulic capillary tubes.

The indicator may be located as far as 250 feet from the tank unit.

A completely self-contained hydraulic system provides indicator actuation. No outside power is required. That, of course, is a substantial safety and reliability factor.

Where level control is required in conjunction with tank-contents measurement, Underwriters Laboratory-approved switches are furnished for the installation.

The tank unit is installed through a single two-inch diameter opening in the tank to minimize construction and alteration difficulties.

Once installed, the system requires no further maintenance.

In addition to the new Model 216 remote-gauging indicator, a variety of other indicators are available for this system. Also available are dial-type hydrostatic and direct-reading tank-contents gauging systems for gauging virtually any liquid.

Full data on the new Model 216 indicator is available from Liquidometer Corp., at 41-03 36th Street, Long Island City 1, N.Y., in the company's Bulletin No. 532.

Segregated Fueling Systems Have Jet Age Significance

Over the past few years, the system of co-mingling different brands of the same grade of fuel has become an increasingly standard operation at many airports.

What this means is that various companies deliver their fuel to a bulk storage area at the airport. The fuels of similar grade are all tanked together. When an airline calls for such-and-such a grade of fuel it gets it all right and, experience has proved, it gets it safely enough. But, for many buyers, there still is the point that the "brand" bought has been lost in the shuffle and the only thing delivered is the "grade."

At many fields the tendency toward co-mingling obviously could grow rather than diminish despite this "brand preference" objection. A notion of increased convenience has surrounded the co-mingling idea.

Now, however, a new factor enters the picture to cast an entirely new light on airport fueling systems. The new factor is jet-type fuel. First, of course, the fact is that the supply of jet-type fuels is already developing on a sort of strict "brand" basis —with Shell supplying a kerosene type to Capitol and Socony supplying a JP-4 grade to Trans-Canada. Beyond this there is the fact that the multiplicity of jet-type fuels available now and, presumably, in the future makes grade *and* brand consciousness more significant than at any time in recent years. Thus, it is safe to assume, a return to emphasis on strictly segregated fueling systems is in the cards.

Because of this, and with the co-operation of the Aviation Technical Service Committee of the American Petroleum Institute, SKYWAYS will present a three-part series showing typical and recommended types of segregated fueling systems that may be used by airport builders and operators.

This first example, which uses a 16-gate airport as the model, provides for complete product segregation of from 1 to 4 petroleum suppliers—all the way from the storage tanks to the airplane.

It provides the same total amount of storage, twelve 25,000-gallon underground tanks, that might be expected at an airport of the same size using the co-mingling system.

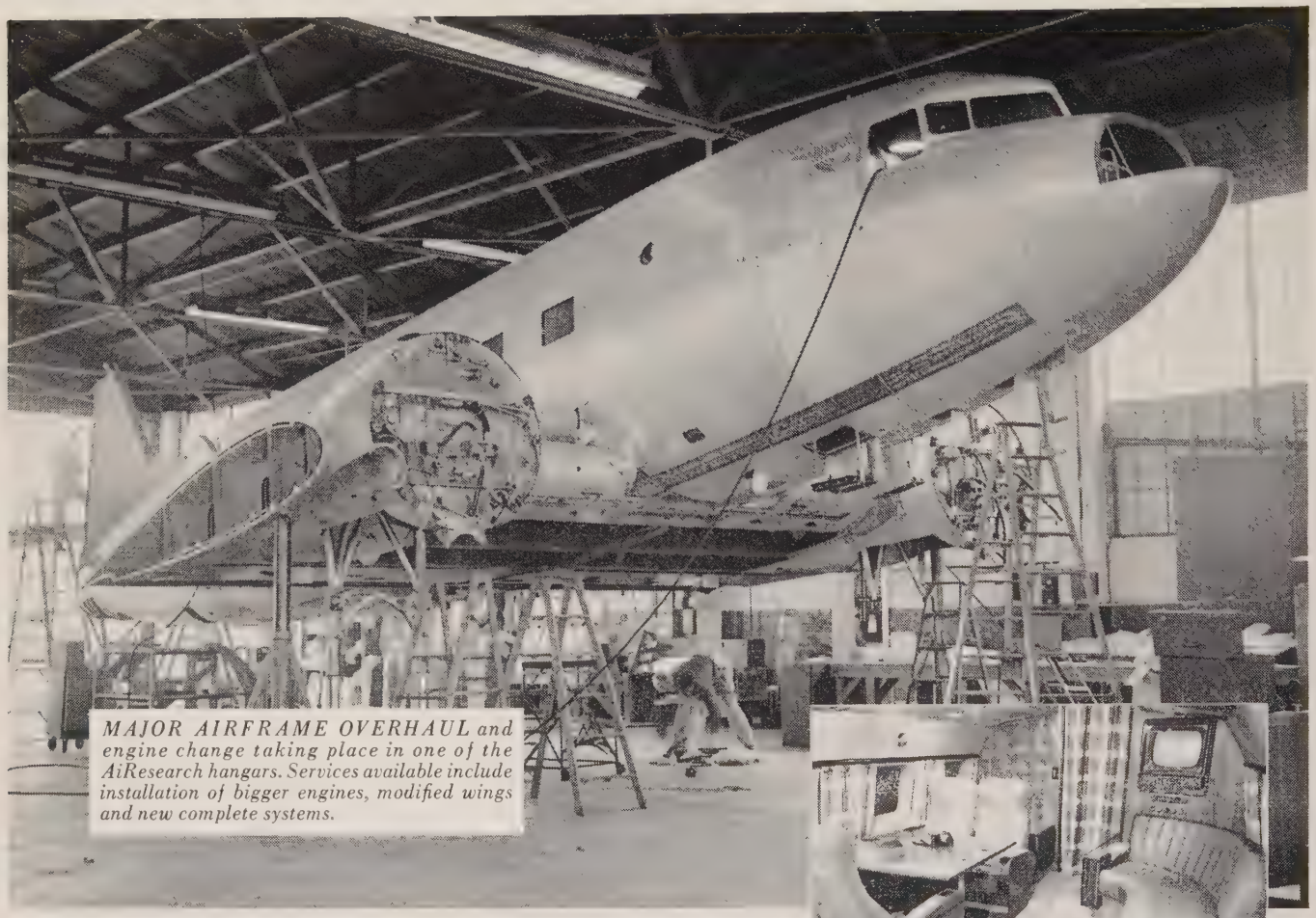
The same rate of flow is provided for in the pumping system, and the same water protection is provided.

Here is how the system works out:

Valves on either side of the pair of laterals leading to the fueling pits permit each gate to be served from either direction, up or down the six-inch diameter mains which connect all gate positions. It can be seen, for example, that by proper positioning of valves, Gate Position No. 7 could be served by either Storage Area "A" or Storage Area "B." Storage Areas "A" and "D" can serve from one to seven gate positions. Storage Areas "B" and "C" can serve from one to eight gate positions.

(*Continued on page* 40)

Every overhaul requirement for your business airplane!



MAJOR AIRFRAME OVERHAUL and engine change taking place in one of the AiResearch hangars. Services available include installation of bigger engines, modified wings and new complete systems.

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NEW RADIO AND ELECTRONICS CENTER has most complete facilities in the nation for business aircraft. CAA certified for Class I and II

Canadian Marconi Enters Lightweight ADF Market

A new lightweight aircraft radio compass has been designed and produced by Canadian Marconi Company, Montreal. Designed specifically to meet the exacting requirements of the airlines, the new radio compass (known as the ADF CMA-301) incorporates new techniques which have resulted in an extremely sensitive electronic unit capable of giving first-class performance. The characteristics of small size and light weight—30 pounds for the complete system—permit its installation in smaller type aircraft as well as large transport types. Thus, the small airline operator may take advantage of lightweight equipment which meets the performance requirements of the large scheduled airlines.

The basic installation consists of a receiver, an indicator, a flush-mounted iron-core loop and a control panel. Single and dual needle indicators are available.

Operation of the receiver is by electric remote control. With this system, the location of the receiver in the aircraft is not restricted to any particular area and the use of two or more control positions for one receiver is possible. Special attention has been paid to the control dial with a view to providing the greatest clarity of frequency indication consistent with reasonable size while the accurate servo system provides a sensitive two-speed tuning control with no backlash. If required, the parts for the controller can be supplied separately for integration in a combined radio panel.

Design of the receiver incorporates unit construction for easy servicing, and use of ARING tubes and avoidance of electrolytic condensers contribute to a high degree of reliability. In addition to normal 28-volt DC model, an all AC version is available.

CMA-301 conforms to all airworthiness requirements of Canadian Department of Transport and of United States Civil Aeronautics Administration, and all components meet military specifications of both countries.

Low-Priced 27-Channel Transceiver Announced

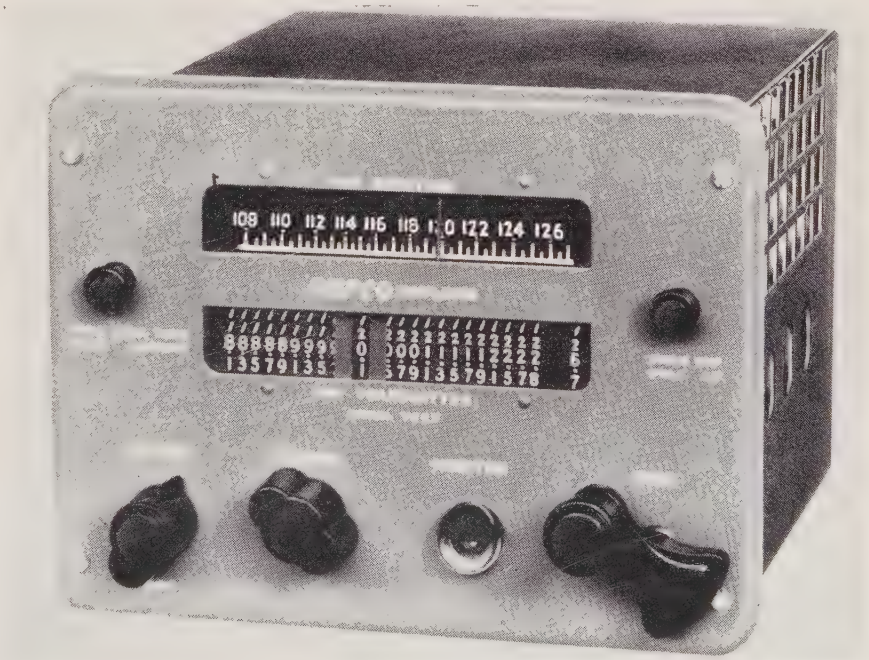
The never-ending race to keep up with VHF frequency requirements is eased somewhat for owners of light-twin and single-engine business aircraft by the announcement of the new NARCO 27-channel Simplexer. Latest development of the familiar and widely used VC-12 Simplexer, it is designed to accommodate 25 of the frequencies now used for airport and enroute air traffic control and communications, and has provisions for two additional crystals.

The 25 crystals provided with the unit can accommodate every frequency used between 118.1 and 122.8 mc plus 126.7 for enroute INSAC communications. Then there is space provided between 122.8 and 126.7 mc for two frequencies for either additional ATC purposes or special purposes such as flight test, instruction, radar control, etc.

The VC-27 provides a basic communications set employing most of the frequencies used by the average non-airline pilot for everyday airport and airway operations under instrument conditions. In certain areas such as New York, Chicago, Los Angeles and Washington, direct Center communications are assigned by routes on frequencies located in the gap between 122.8 and 126.7 mc. This increasing trend and the evident inability of ATC to settle on a minimum of so-called "common" frequencies that could be used by all centers, adjoining or not, to service the growing field of business aircraft is a form of discrimination that places a heavy and sometimes impossible burden on the operators of such aircraft.

The heavier twin-engine business aircraft usually are way ahead of the air-carriers in acquiring the latest and best equipment. Some of them, however, fly war-surplus type aircraft in which compliance with the necessity for even a half-dozen extra frequencies scattered along the frequency bands makes mandatory the entire replacement of their radio complement at a time when economically it may be hard to justify to company comptrollers.

The operators of light-twins face an equally disconcerting problem in space and weight limitations and, if they have been so unlucky as to have already installed the semi multi-channel rigs, duplication may be impracticable. The glib answer of pointing out the availability of 360-, 480- or 800-channel equipment is an affront to a large portion of the flying taxpaying public. A better answer would be to insist that ATC develop and install common channels that can be "keyed" in at will at any ATC route sector. It is true that ATC does not decline to handle any aircraft that cannot work them directly. But it is also true that the



NARCO VC-27 SIMPLEXER *was designed specifically for business aircraft and provides for 24 channels currently in use for airway and airport traffic control, plus 126.7 mc*

alternative "horse-and-buggy-age" system of relaying the necessary clearances and ATC instructions through an associated INSAC for close-in arrival and departure handling in congested areas is offered in an unmistakable atmosphere of indignant toleration for the offending pilot.

The advantages of cross-banding, such as would be the case if ATC would employ some "common" listening frequencies, are daily more evident as the simplex channels become so cluttered that pilot and controller alike fight to get on the frequency. Cross-banding is a facility of the Simplexer that even the most expensive crystal-controlled airline transceiver cannot achieve. Certain of the airlines accordingly have planned their layouts to achieve this versatility at a price few company-aircraft operators can afford.

The VC-27 can fit into any "glove-compartment"-size rack, measuring only 3 inches high by 6¼ inches wide by 6⅝ inches deep. The power supply can be remotely mounted wherever convenient.

"Whistle-stop" tuning to insure accurate tuning of desired listening frequency *before* calling is retained from the original Simplexer. Aside from the obvious advantage of accurate tuning without "head-down-and-locked" tactics, the elimination of embarrassment caused by being told by a facility on a crowded frequency band that all your calls were read and answered, is pay-off enough for this handy feature.

Weight of the entire unit is only 3.2 pounds, while power supply varies from 3.5 pounds to 7.1 pounds, providing a total installed weight of 10.3 pounds. Basic cost, less power supply, is $275 plus $11 for each factory-installed crystal where the purchaser wishes to select his own frequency combination. If purchased with a standard complement of 25 crystals, a price of $480 has been established, thus a saving of $70.

ARC CD-1 *is designed to provide correct heading for precise localizer approaches*

Air-Aids Spotlight

ANDERSON, S. C.—*VOR name and identifier changed to ROYSTON, Ga. ("RYN").*

BOSTON Area — *CAUTION! BRADLEY ILS causing interference on 110.3 mc with BOSTON ILS at altitudes 5,000 ft and up.*

CHARLOTTESVILLE, Va. — *New ALBERMARLE airport opened 7 s mi North with one hard-surfaced runway 4,658 ft long; 80/90 fuel.*

CHINCOTEAGUE, Va. — *LF-Range on this coastal skyway changed freq to 221 KC, in swap with Langley LF Range now on 227 KC, to eliminate interference from Mitchel LFR 200 miles away!*

FT. SMITH/VAN BUREN, Ark. —*LF voice on 323 KC decommissioned and voice facility transferred to VAN BUREN radio beacon, on 236 KC.*

FT. WAYNE, Ind.—*ILS due to resume operation.*

JACKSONVILLE, Fla.—*CRAIG Field now has Unicom.*

LANGLEY, Va. — *DENDRON radio beacon now on 368 KC.*

LOS ANGELES, Calif.—*South course LFRange swung westward to 160°-340°, increasing separation between SAN PEDRO and LONG BEACH holdings.*

NEBRASKA Area — *State of Nebraska installing VOR's in the open quadrangle formed by Victor 6, Victor 15, Victor 26 and 169, OMAHA–CHEYENNE–SIOUX FALLS–RAPID CITY. Located as follows: TVOR on 113.9 mc "OFK" at NORFOLK, BVOR on 112.7 mc "ANW" at AINSWORTH, TVOR on 117.2 mc "AIA" at ALLIANCE on the airports.*

OKLAHOMA CITY, Okla. — *Radar arrival and departure control instituted for all IFR-plan flights regardless of weather.*

STROUDSBURG, Pa. — *Long-needed BVOR on 116.6 mc "SSB" located at critical traffic point intersection of Victors 164-188 and Victor 39.*

To add omni navigation function to the Simplexer, whether used as additional equipment for dual-omni purposes or as original or replacement equipment, the Narco Omniplexer unit can be attached simply by plugging it into a receptacle provided in the rear of the Simplexer. This unit, weighing only 2.2 pounds, can be mounted on top of the Simplexer or separately at some other more convenient panel location. Cost is $195.

RTCA Publishes Performance Standards For Airborne Radio

In recent publications prepared by the RTCA Sub-Committee 58, there are set forth minimum performance standards for airborne radio communications transmitting and receiving equipment operating within the radio-frequency range of 118 and 132 mc.

Compliance with these standards is recommended as a means of making sure the equipment will satisfactorily perform its intended function under all conditions normally encountered in routine flight operations.

Inasmuch as the measured values of radio equipment performance characteristics may be a function of a method of measurement, standard test conditions and methods of test are described for the guidance of radio check and maintenance personnel.

Both are excellent papers for the enlightenment of technical personnel charged with the proper maintenance and repair of aircraft radio and may be obtained from the RTCA Secretariat, Room 2036, Bldg T-5, 16th and Constitution Ave., N.W., Washington 25, D.C., at a cost of 30 cents per copy. Do not send stamps.

ARC Announces New 10-lb Course Director System

A new course-director system with a total weight of less than 10 pounds and low power requirements was announced by Aircraft Radio Corp., Boonton, N.J. Known as ARC CD-1 Course Director, the system is designed to provide correct headings for precise localizer approaches and to give accurate enroute tracking

of omni-directional VHF ranges.

The new ARC Compass-Slaved Gyro furnishes precise, stabilized directional information to the heading computer and is the heart of the course director system. Track information is obtained from a conventional omni-localizer receiver to intercept and maintain the desired track. Crosswind drift is automatically compensated, and the flight track lies directly along the course center despite abrupt wind direction and velocity shifts.

The CD-1 system is designed for use during all phases of enroute, approach and holding problems. It performs its function by adding correct azimuth data to the localizer or omni signal and indicating the result on the cross-pointer needle of the indicator.

The new system will be valuable in providing magnetic heading data on flights *lacking radio track navigational facilities.*

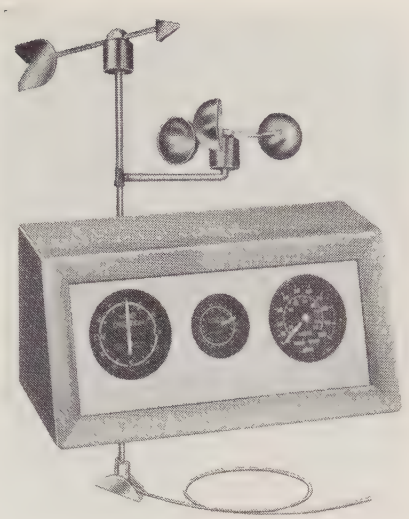
Vertical needle, which responds to compass-controlled azimuth gyro, provides a means, even in severe turbulence, of maintaining a precise heading. Power requirements for CD-1 are 3.5 amps at 14 volts DC or 2 amps at 28 volts DC. It is suited for use in the new light-twins, current single- and multi-engine business aircraft.

Local Weather Measuring Gauge Forecasts Trend To Private Company Use

As the use of aircraft by companies engaged in field work increases, the need for privately owned weather-reporting facilities has become more apparent. In some cases, the lack of immediate information as to critical weather changes has been a deciding factor in serious accidents (*see NAVICOM, July, 1955*), and in many unreported instances, otherwise feasible aerial operations have been curtailed because of this lack.

In such remote field locations as mining, drilling, etc., the combination of adequate and accurate weather measuring instruments plus Unicom or equivalent company-frequency radio is a "must" to efficient and safe operation. Unicom and company radio have been paying their way for some time. Ceiling and other factor-measuring instruments for private use are not yet generally available. But wind-measuring instruments have been in existence for some time in various but mostly unsatisfactory forms, and little reliance has been placed by pilots on such gadgets in preference to the traditional field-circling maneuver at low altitudes to examine and interpret cleverly hidden wind socks.

In the new low-cost Wind-O-Meter originally designed for government



WIND-O-METER, *new wind-measuring instrument, is now available for private use*

use, the Aircraft Components Inc., of Benton Harbor, Mich., has shown an instrument of airline-type accuracy, wind-tunnel calibrated. It measures 360° wind direction, temperature from —40 to 120°F and wind velocities up to 100 mph. Tornado winds will not damage the instrument. Features of Wind-O-Meter include a dial that reads in both miles-per-hour and knots, sealed ball bearings, built-in provision for emergency battery operation and an outside transmitter unit that can be located several hundred feet from the inside desk-top cabinet. Optional electric remote-indicating thermometer also is available. The unit sells for $99.50 and is mounted in a blond maple cabinet featuring an easy-to-read sloping front.

There is an obvious question that might be asked regarding the extent to which the government will allow the use of private weather-measuring and reporting instruments. Inasmuch as the factual reporting of wind data and temperature is not a matter of trained interpretation, the use of such instruments as the AC-3 Wind-O-Meter will not be a matter of regulation. Measuring of ceiling and visibility is now subject to the requirements of certain basic training and certification which can be met by any reasonably intelligent employee of any company. It is not too far-fetched to envision that given low-cost accurate devices, the requirements for this purpose for private use only eventually will be minimized to the same extent as the aircraft radio operator permit.

Bendix Demonstrates Transistor-Equipped Automatic Systems at LGA

The first successful flight with all-transistor-equipped automatic navigation and landings systems was demonstrated at LGA by Bendix Aviation.

Last November, Bendix displayed a transistorized autopilot control. Now, the system is extended to complete radio navigation and instrument approach. The system is installed aboard Bendix' "Flying Laboratory," a B-25 based at the Eclipse-Pioneer Division plant at Teterboro, and was demonstrated at LGA by Roy Ryder.

The PB-20 autopilot is basically a transistorized autopilot with an integrated electro-mechanical computer requiring no additional equipment for automatic response to radio flight facilities. As a follow-up, Bendix engineers are pointing toward the equipping of all flight-control systems with transistors instead of vacuum tubes. Advantages of transistors in aircraft servo systems include their indestructibility and the fact that they require so much less power than vacuum tubes that heat problems are eliminated.

Ideal for use with the low frequencies which usually characterize servo systems, transistors will be applied to Bendix' integrated navigational flight system. System ties in airborne radar and DME with components of automatic flight equipment, and displays to the pilot signals going to autopilot. May be used as an instrument grouping for manual flight.

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New! A Practical Audio Amplifier for cockpit & cabin speakers at a practical price. Weighs only 2¾ lbs. less shockmount. Call, write or wire today. Immediate delivery.

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8 W. with 2% Distortion
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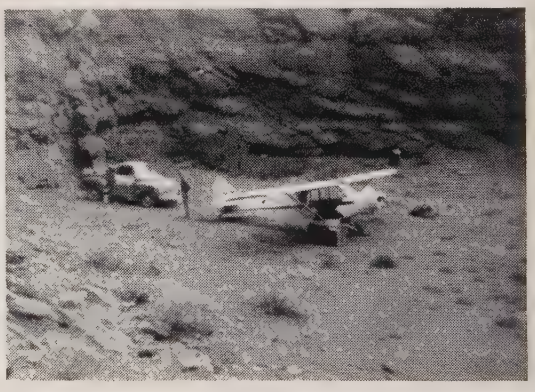

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MORE PEOPLE HAVE BOUGHT PIPERS THAN ANY OTHER PLANE IN THE WORLD

Helio Courier

(*Continued from page* 12)

first run, even with an uninitiated pilot, the airplane was well over 500 feet up at the end of the take-off runway (just 900 yards from the start of the take-off run) The second take-off was full flaps, full power. Even with the "stretched out" experience of the previous take-off, the airplane was ready to fly again before expected; by the time the throttle was opened, it was ready to lift into the air! Performance tests have indicated the airplane can be taken off, banked sharply in a climbing turn, and will reach an altitude of 50 feet at a point approximately 200 yards from the point of take-off.

Two or three winds of the trim tab and the airplane was trimmed to fly hands-off in an 80-mph climb. That the *Courier* stays where you put it is probably one of its most striking features from the point of view of handling ease. It can be banked and turned with aileron alone, though coordinated rudder and aileron produces a more perfect turn if an abrupt change of attitude is desired. When placed in a chosen degree of bank, the plane will turn steadily, neither increasing nor decreasing the bank. Trimmed for straight-and-level flight, it has a steady (wing loading—about 13) feel and excellent directional stability, giving the pilot confidence that he could consult a chart, set the radio, etc., and find the airplane firmly on course, straight and level, when looking up from the cockpit again. The airplane indicates 40 mph at cruise—engine setting 2600 rpm, 24.5 inches. The noise level in the cockpit is not exceptional—about the same as other airplanes of its class. Its slow-flight performance, excellent control and ease of operation are its outstanding qualities. Once trimmed for slow flight (80 mph, no flaps), you need no further changes in trim for any configuration or speed you choose. If half flaps are put down, the nose will automatically seek a more nose-up attitude and be perfectly in trim, hands off, at 65 mph, the proper half-flap speed. Putting down full flaps will cause the airplane to seek a further nose-up attitude, and with no change in trim, will fly hands off at 50 mph. The airplane does not stall as such at low speeds because the elevator travel is restricted and you do not get a high-speed stall in a slatted airplane, (The slat action has not been mentioned specifically here simply because it is automatic and just part of the airplane's performance. The slats pop out as the airflow over the leading edge demands, and require no attention from the pilot.)

At 40 mph the airplane feels and responds solidly. It can be wrapped over into a very steep bank with as good aileron response as it has at cruise. Slowing the airplane below 40 mph takes effort to hold the wheel back and the pilot will be busy "flying" it to keep the wings level. It feels a little loose but is never without very good control—which is an amazing experience. It can be put into a steep bank no matter how low the speed.

If the nose is pulled up high—about 20° above the horizon—the speed will drop down below 35 mph and a shuddering can be felt. The airplane will mush along with wings level, losing altitude quite rapidly but will not have a tendency to fall off. It is an odd sensation to realize one should S-turn in the air to see ahead! Another point to note, even with protracted operation at low speeds, cooling is adequate.

Landing performance is startling but smooth and easy, requiring little from the pilot. With half flaps, 60- 65-mph glide, power off, the *Courier* has a 10-1 glide ratio and handles like any other airplane of its class, with a normal flare prior to landing three point. The landing run, of course, is very short, the airplane losing forward speed almost immediately after touch-down. With full flaps, the flare out is quicker and some power is left on so that the round-out need not be abrupt. For emergency operation, however, with full flaps and power off, the nose is pointed right down at the runway and the airplane can be stopped in far less than 100 feet from point of touch-down. This type of landing is only recommended for emergency operation as it requires quicker reaction than the half flap, or power-on full-flap landing. The main landing gear is strong and located forward in such a position that a landing can be misjudged and be very sloppy with no worry at all.

As to possible weaknesses in the *Courier*, nothing has been turned up yet. Six planes have been in exploratory operation for a year and, with one exception, no replacements have been needed from the Helio shop and nothing but the usual maintenance attention and engine and accessory repair. That one exception was a bent tailwheel fork on an airplane that landed short and ran into an embankment on a poor field (off-airport operation).

The Helio *Courier* is exceedingly safe but not if the pilot abuses good sense. The Helio will have an excellent record because it probably will be flown by business executives and sound pleasure flyers. The performance of the airplane overcomes the need for skill; you cannot stall or get into trouble "aerodynamically," but . . . you do need reasonable judgment. Perhaps someday aircraft will be invented with even judgment built in but no airplane not even the *Courier* can overcome foolhardy direction from the cockpit—weatherwise or flight-planning wise. Flying into the overcast if you cannot fly on instruments isn't answerable by the airplane. The Helio *Courier* can extend your "effective" visibility through its slow-flying performance, but if you cannot see ahead, and you continue your flight, it cannot keep you from hitting an obstruction in your path.

Several Helio *Couriers* were in operation for a year prior to the *Courier's* being released for sale.

One was put on floats for the Helin Tackle Company of Detroit, and has been operating in and out of the company's every business port-of-call. Station KSTP in St. Paul, Minn., has operated their *Courier* as a photographic and courier airplane. While the floor of the aircraft could have been modified to accommodate a camera door, Station KSTP found it easier to take their pictures through the rear cabin window space (the window is at a point of neutral pressure and can be removed).

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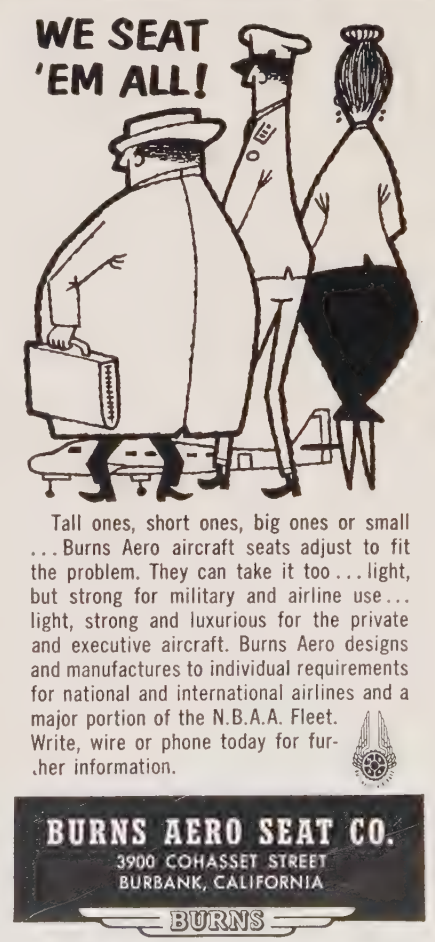
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SEVERAL COURIERS *were in operation for a year before plane was put on market. One (above) was used by Station KSTP, St. Paul, Minn., as a photographic, courier plane*

Powerplant: Geared Lycoming 260 hp.
Propeller: Hartzell, Constant Speed (standard hub, oversized blade).
Construction: Wing: all aluminum, low-drag cantilever. Fuselage and tail: semi-monocoque stressed skin. Cabin: steel tubing aluminum clad.
Loading: Weight empty—1800 lbs.
Useful load—(CAR 08) with cargo and crew only . . . 1,620 lbs.
Useful load—at design gross of 3,000 pounds (pending certification) . . . 1,120 lbs.
Useful Load—per original CAA Type certificate . . . 920 lbs.
Range: 600 miles at normal cruise with 60-gal fuel capacity.
Fuel consumption—14.5 gph.
Operating cost: Direct operating cost under $10 per hour (See Chart).
Take-Off and Landing Area: no wind obstacle: *165 yards*
Service Ceiling: 25,600 ft.
Operational Speeds:
Minimum, fully controllable level flight ..... 30 mph
Power-off minimum ..... 41 mph
Sea-level cruise @ 75% power ..... 142 mph
Optimum cruise, 8500 ft @ 72% power ..... 157 mph

Two have been used for personal and business transportation of their owners, and a rancher in the Rio Grande valley has been operating his for the usual flying farmer activity. All of these users report that landing in any good convenient field is commonplace with them. In case you wondered what the regulations on off-airport landing are, there is no CAR against it, and at this time no known State rule forbidding it, but permission from the owner of the property is needed or a trespassing charge may be filed. The slow landing speed seems to be a favorable point when a property owner's permission is requested. And one small caution—when landing off-airports on peculiar terrain, besides the usual precautions remember to take a look at your tires to see if they have been damaged by sharp stones, sticks, etc.

What could a Helio *Courier* do for you? You could operate plant-to-plant with great ease and efficiency; it has excellent qualities for any type of aerial coordination of widespread surface activities or aerial surveying for real estate, traffic, pipe line patrol, etc. Pleasure travel to beaches, golf courses, becomes a reality.

How does it compare with a helicopter? It does not hover or land and take-off vertically—it is an airplane requiring a 100-yard operating strip. As for the helicopter, the cost, level of skill needed, load-carrying limits, sensitive maintenance needed and other present disadvantages seem to have kept it from any but very specialized uses in business transportation at the present time. The CAA's survey of "The Airplane at Work for Business and Industry" shows a total of only 16 helicopters in business use (included in such use would be the operation of the Port of New York Authority, for example) with a total of about 18,000 aircraft used in business transportation. Of this 18,000 total, there were 1,650 multi-engine business aircraft which flew 17% of the total flying hours. At the present time, the four-to-five place single-engine, all-metal, 145-hp or more executive-type airplane "has become a predominant element in the business-flying field," particularly among the progressive smaller concerns. Helio *Courier* promises to add other companies and individuals to the business-plane-owner ranks.

Courier is being manufactured, under contract from Helio Corporation, at the rate of one a week by Mid-States Manufacturing Corp., Pittsburgh, Kansas, and is being marketed throughout the country by a small group of six distributors and the company sales office at Norwood, Mass. Helio has foreign sales representation throughout the British Commonwealth and Europe.

Standard equipment included in the $24,500 FAF airplane includes CAA standard instrument panel, shoulder harness and safety belts, two 30-gallon wing tanks, navigation lights, cowl flaps, ejector tube engine cooling, constant speed propeller, hydraulic brakes, cabin heater. Additional equipment, floatplane fittings and all other individual preferences can be provided at the factory on order.

Chart A: OPERATING COSTS

I. COST ELEMENTS:

A. Fixed Costs	Per Year	Per Month
Depreciation	$3,000	$250
Insurance, Hull	1,225	125
Liability and Miscellaneous	275	
Storage	600	50
Total	$5,100	$425

B. Direct Operating Costs, per flying hour	
Gas and Oil	$5.14
Maintenance: Airframe	2.00
Engine	2.25
Equipment	.50
Total	$9.89

II. VARIATION OF PER MILE COST WITH UTILIZATION:

Flying Hrs Per Mo.	Fixed Costs	Dir. Op. Costs	Total Cost	Equiv. Rd. Mi.	Aircraft Cost per Rd. Mi.	Inclu Com'l pilot @$450 p.m.
25	$425	$247	$672	4,150	16.2¢	(3)
50	425	494	919	8,300	11.2	16.5¢
100	425	989	1,414	16,600	8.5	11.2

1 Based on 3-year ownership.

2 Assuming a block-to-block average speed of 150 mph and a conversion factor of 1 road mile equal to 0.9 air miles. One flying hour then covers the equivalent of 166 road miles.

3 Full-time pilot flying only 25 hrs per month raises per mile cost to 27¢; however, part-time services of pilot from local airport commonly used at $5 per hour, giving a total per-mile cost of 19.2¢.

Honeywell Combines

(*Continued from page* 13)

Canada and Mexico. Its staff of pilots number nine and are James Bailey, James Bradford, James Magnus, Robert J. Whempner, Ridge Baker, Tom Grove, Robert McGregor, Bob Gorham and Bob Ward. Tom Grove is chief pilot of the business flying activity.

In recognition of Honeywell's outstanding flight safety record, the National Business Aircraft Association at its 1954 convention in Dallas, Texas, presented the company with its highest award for materially contributing to the advancement of business flying.

Its present DC-3's are equipped with the latest in VOR and ILS radios, Honeywell electronic fuel gauges, Honeywell autopilots with latest altitude controls, automatic beam guidance systems which include automatic VOR, ILS and glide slope coupling. Early in 1955 DME (distant measuring equipment) and a powerful 144-Channel ship-to-shore telephone were added.

Meanwhile the company's test and research programs have grown apace with the rapid expansion of its Aeronautical Division. Today, it provides complete in-flight studies of experimental autopilots, fuel gauges, engine controls, gyroscopes and other aircraft devices and systems. In addition to its product development program, the company's Aeronautical Division has had engineering contracts with the military services for system designs.

Typical results of the combined engineering, research, flight test and manufacturing operations in the company are such developments as control-stick steering, automatic beam guidance and automatic carrier landing systems.

Control stick steering, developed by Honeywell, provides "normal" pilot control in either manual or automatic flight, conserves cockpit space by reducing clutter, and provides a logical cockpit configuration for the aircraft of the future which may be completely autopilot-controlled from taxi to take-off to return to the ramp.

Newest Honeywell-built automatic beam guidance systems provide for automatic navigation of omniranges, ILS systems to include automatic transition from the localizer phase on altitude control to control on the final approach with glide slope, automatic power control and a coupler for automatic ground control (AGCA).

Honeywell's flight operation is headed by T. U. Grove, Chief of Flight Test, and Robert J. Whempner, Supervisor of Aircraft Operations. Eight pilots and 42 aircraft engineers, mechanics, flight and ground test technicians, draftsmen and ground operations personnel are employed. In addition to their transport flight duties, Honeywell pilots and engineers have studied a wide variety of automatic control devices on planes ranging from AT-11's, P-38's, B-24's, and B-29' of World War II fame to present-day F-89's, F-94's, B-50's and newest supersonic F-100 *SuperSabres* as well as Navy F2H3's and HUP helicopters.

More than 1,400,000 fatality-free miles of strictly test flying have been rolled up by the Honeywell pilots.

NBAA *representative is J. Magnus (left), shown here with T. Grove, R. J. Whempner*

Explaining the scope of the company's duel flight operations, NBAA representative James Magnus, points out that Honeywell normally receives planes for test and experimental work soon after they come from the production line. Honeywell's CF-100, for example, was only the fifth such plane built by A. V. Roe, Ltd., and only the second or third in production equipped with the new *Orenda* engine.

When a control is conceived by Honeywell design or research engineers and the components have been fabricated and assembled into a working breadboard model, checked through the Aero Test Department for flight worthiness, it is delivered to flight test for installation, explains Roy I. Crask, chief flight test engineer.

The flight test technical group is responsible for the installation, instrumentation, ground check and operational safety of the plane with the new equipment installed on it. Draftsmen make detailed drawings of each installation.

Flight test engineers control the flight programs for all experimental, developmental and research flights. The engineer remains in close contact with the design and research engineers to coordinate ideas on the equipment under test, to prepare flight plans, decide the instrumentation needed, and to write progress and final reports of the tests.

These tests, Crask adds, are often as exacting as any given the plane by the manufacturer or the Air Force. For example, to develop adequate "G-limiting" equipment which is featured in Honeywell E-11 and new E-10 autopilots, it is necessary to subject the aircraft to repeated high-G tests at all altitudes, speeds and attitudes.

"Today's planes," Crask said, "are fantastically complex mechanical devices requiring careful inspection and maintenance. Moreover, normal and routine maintenance must be supplemented by rigid pre-flight inspection by an authorized inspector and by the test pilot."

During a typical Honeywell test flight, the pilot maintains constant contact with ground observers, reporting on the progress of the test on a specially-assigned radio frequency. Often questions arise regarding certain phases which can be answered through air-to-ground conferences between the pilot, observer and design and research personnel without the necessity of landing or making additional flights.

During the flight tests the observer watches responses to various factors which are recorded on an eight-channel flight recorder installed in the plane. An indispensable teammate to the pilot and test engineer, flight recorders have been custom-built by the Honeywell technicians who are responsible for the instrumentation. Some of these instruments are valued at more than $20,000 apiece.

After each flight, all graphs and test records are removed and carfully studied by all interested parties to obtain data which determines adjustments, modifications and additional tests to be made before and during subsequent flights. Tape recordings of all communications between the pilot, observer and ground technicians are made during the flight, these are coordinated with the readings on the flight recorder.

According to Magnus and Crask, use of latest computing equipment in the company's aeronautical research division makes it possible to solve many complex flight-test problems before the plane leaves the ground. Some, in fact, are solved even before the control device or system is built.

Such computers were extensively used in solving flight problems in the development of "B-Line" beam guidance, automatic carrier landing, fire control tie-in and similar advanced systems.

Use of this equipment—capable of solving in seconds amazing flight equations—is an outstanding example of the broadening horizons of the Minneapolis Company that was founded some 70 years ago to produce a single instrument—the home thermostat.

Today, in its 10 divisions, Honeywell manufactures more than 9,000 different automatic control devices and systems. In addition to the autopilots, gyroscopes, fuel controls and other complex systems made by its Aeronautical Division, the company's products include heating, ventilating and air conditioning controls for residences, buildings, ships, trains and buses; industrial indicating, recording and controlling instruments for industral processing; and precision snap-acting switches for more than 1,000 different uses.

It also manufactures valves for controlling water, steam, air, gas, oil and other liquids; advanced controls for armored vehicles, ammunition and other special ordnance devices; ultra-sonic equipment for underwater operations; precise electronic recorders and photographic flash equipment.

The company is headed by Paul B. Wishart, President, and Harold W. Sweatt, Chairman of the Board of Directors. Mr. Sweatt is the son of the founder of the company.

Stephen F. Keating is the Aeronautical Division Vice President.

Employing more than 25,000 persons,

Honeywell has manufacturing operations in Minneapolis, Philadelphia, Los Angeles, Chicago, Seattle, Wabash, Freeport, Denver, Boston, Amsterdam, Toronto and Newhouse, Scotland. In addition to the sales and service offices of its other divisions in every principal U. S. city and in 34 foreign countries, its aeronautical division maintains regional offices and field service representatives in Boston, New York, Seattle, Dayton, Philadelphia, Toronto, Fort Worth, St. Louis, Washington, Los Angeles, San Diego and Wichita.

Power Boost for Bonanza

(*Continued from page* 15)

haul operation as the occasion arises.

Like the DC-3, it appears that *Bonanzas* never wear out. They just go on, major after major, new engine after old. So, not being satisfied with only the reactions of Mr. "A" and myself, I felt that it was desirable to query some other owners of "rejuvenated" *Bonanzas*. I found Mr. Charles Ripley, Investment Counselor of Wall Street and Oyster Bay, N.Y. who flies his for personal pleasure and business. His Nan 2009 Delta had been a 185 model and, as was to be expected, he was jubilant about the increase in performance. Significant is the fact that he passes over the take-off performance with a light, "Oh, I expected to get off like a scared cat and so wasn't surprised when it did."

More pertinent is the fact that, already owning one of the faster, earlier models, he states that his average cruise was upped as much as 10 mph. He reports that he has gotten as high as 150 IAS at 8,000 feet at standard temperatures and that average ground speed over a 2,000-mile round trip, up and down wind sustains those figures. Gas consumption rose to about 11 gph and Mr. Ripley says he would consider this a small premium for the added performance.

Another conversion was that of Mr. C. G. Triest, independent oil producer and business pilot who uses his airplane constantly in his business. His ship, Nan 1840 Delta, based at Zahn's Airport, Amityville, N.Y., produces an indicated airspeed of 155 at 22 inches and 2250 rmp at 4,000 feet and he says he has done even better above that altitude. His was a C-35 model before conversion. Like "Baby Doll III," Mr. Triest's *Bonanza* has "everything but the kitchen sink" hanging out in the breeze, so he feels that the conversion was well worth the cost in restoring original factory performance or better to the airplane.

Samples taken from the power and performance charts supplied with the conversion are offered herewith. With respect to the performance figures, the writer presumes that an unusually clean and unencumbered airplane was employed.

Power-boosted *Bonanzas* are handy tools of industry. Their increased performance, thanks to the Continental E-225, adds to their popularity for business.

FIERY!

MOODBEAMS # 9

Candy Barr is firing a two-gun salute for a double-barreled reason:

(1) SAC beat its 150-day deadline with USAF jet engine overhauls and now is moving ahead with third-month production, and

(2) The shop, as usual, also is doing a great job for piston engine owners and Sept. 21 will join Pratt & Whitney Aircraft in a gala Engine Forum at Dallas.

P.S.: Candy will be at the Forum party — all green-eyed, blond-haired, 5′ 3½″, 122 lbs. of her!

Southwest Airmotive COMPANY

LOVE FIELD ☆ DALLAS

Skyways Round Table

(*Continued from page* 19)

Randy Carpenter: *"Lou, in your work you have had a lot of experience training paired crews. Have you made any special attempts to handle the training for crew coordination?"*

Lou Achitoff: "We train a pilot and copilot as a team. Our flight instructor sits in the jump seat or stands between them, as the case may be. We discourage the flight instructor's sitting in the right-hand seat for instructional flights except on special invitation of the crew being trained or when it is necessary to demonstrate a particular maneuver. Our primary interest is to train them as a crew and so we feel it is equally important to concentrate on the copilot so that he will perform his duties in a manner that indicates he is aware of his share of the responsibilities in the cockpit. The pilot and copilot must understand what each other's duties are. In short, we feel pilots and copilots are inseparable.

"In addition, the training should be conducted so that the corresponding crew members are interchangeable and can work with each other, each knowing what the other is supposed to do. This standardization of action is important because it enables a copilot to assume, and correctly, that no matter which captain in the company he is flying with, that particular captain will act in accordance with established plans or procedures. If, for example, the copilot operates the throttles in one airplane during the ILS approach, he normally would be expected to operate the throttles in the company's second airplane. There should be no reason why this procedure should vary from captain to cap-

tain, once the chief pilot decides that it is the most desirable.

"Going back to pilot prerogative, I think there are certain situations in which the copilot would not be doing his job if he didn't take over the airplane. Capt. Smith's example, the rapid closure of aircraft, would be one instance when the copilot should take over. Similarly, in the case of engine failure on take-off the copilot would be justified in checking the throttles. Let's assume you are 10 or 20 mph below V_1 and the copilot notices the oil pressure suddenly drop down to 5 pounds and the engine begins to miss, and the captain has not become aware of the condition. Acceleration between 70 and 80, and 80 and 90 is quite rapid. By the time the captain may have decided whether or not to continue the take-off, the airplane may be past the speed that is safe for stopping. The airplanes are fortunate in that most of their aircraft have reverse thrust, but the business-plane operator usually doesn't have that advantage.

"Capt. Smith, would you object if your copilot took the throttles under those conditions?"

Capt. E. J. Smith: "First of all, there is a fine line of demarcation there. I don't know whether or not I would want the copilot to holler out that the oil pressure was low in Number One because, actually, there isn't any emergency existing right at that point that would necessitate the copilot's shouting it out. I know I can accelerate that airplane to V_1 and still stop within the limits of the runway. In that instance and from the way you put it, I believe the first officer should signal what he has noticed as an out-and-out malfunction."

Lou Achitoff: "Randy, do you think there is an area that can be outlined in which, by coordinated reasoning between the two, we could set up some kind of system whereby, generally, the copilot should take over, as in the case of oncoming aircraft, obstacles, etc?"

Randy Carpenter: "*No, I do not. I believe that in the initial selection of a captain you have evidenced faith in his judgment. It's an intangible thing, but I believe Capt. Smith and Capt. Bledsoe will bear me out, that you can pretty well select people with judgment. From that point on, you have to go along with the judgment of the man you selected and any deviation would have to be handled on an individual basis.*

"*Capt. Smith's point with respect to collision is about as clearly on one side of the fence as you can get. There's not much else you can describe that could, in the normal course of events, be so close to the narrow line that you could define it on that score.*"

Wm. E. Shaughnessy, Jr.: "You have all this faith in your captain's judgment, but if he hasn't seen that the right engine is on fire or that the oil pressure has gone way down, he isn't in any position to exercise his judgment, and by the time you bring these things to his attention and give him a chance to display his judgment, it may be too late."

Capt. E. J. Smith: "There is no such thing as coordination without a good coordinator, and there is no such thing as a good coordinator unless the individual has command authority. You don't list emergencies in a book and say to a man that if such-and-such happens you just go right down the rules and that's all there is to it. An emergency in the air seldom resembles those that are written down in the books.

"When you have an emergency in the air, it is the individual who has good command ability who can analyze the situation and delegate the authority of responsibility to other men in the cockpit so that he remains free to be an overseer of the situation. It is that individual who insures coordination. You can't write rules and regulations, step by step, and alleviate the emergency."

Capt. J. F. Bledsoe: "That's 100% correct."

Capt. E. J. Smith: "I'd like to go a step further and state that a pilot who might be classified as physically lazy but mentally alert is the best pilot. He will say, 'You do this'; and 'You do that,' and he just sits there and oversees the whole operation. He is in complete command of the airplane. But the individual who tries to do everything himself just can't do everything 100% because he is in a sweat all the time. The pilot who sits there and oversees is in the best position."

Wm. E. Shaughnessy, Jr.: "That's absolutely right. The merchant marine operates that way. The master of the ship does nothing but render the critical decisions."

Don Baldwin: "Is there any particular factor that adversely affects crew coordination? Why can't 100% crew coordination be achieved in every case?"

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Capt. E. J. Smith: "The captain who has to do everything himself is the greatest single factor that distracts or eliminates crew coordination. In the Dehmel trainer we can set up a configuration that will really jam up a pilot if he attempts to do everything himself. With the DC-6 we have a captain, a copilot and a flight engineer. We tell the captain that in an emergency he flies the airplane and delegates responsibilities to other crew members. He does not fly the airplane and do everything else while the other two crew members sit like bumps on a log. He must utilize the manpower available in the cockpit. We try to show him the easiest way to do things brought about by good coordination."

Randy Carpenter: *"In the delegation of authority, you also are developing judgment. You are giving people an opportunity to exercise judgment under supervision and, in a sense, you are guaranteeing yourself competent first pilot material.*

"Mr. Davis, would you give us your thoughts on crew coordination where specific emergency procedures are involved?"

W. O. Davis: "The best long-range philosophy is that the burden of decision always has to rest with the commander of the airplane. The general approach to emergency procedures is only as good as the commander. I cannot go along with this philosophy that a group of rugged individualists should start running off in different directions predicated on how each individual rates himself.

"In all this we have to go back to human engineering, back to an unerstanding of the human mind, how it functions and why it thinks as it does. Pilots are only human, subject to the foibles of human nature.

"The entire approach to training has to be overhauled from the standpoint of a firm understanding of human psychology. The people involved in training also must have a knowledge of the human machine. That doesn't mean everyone has to have a PhD in psychology. It seems ridiculous to spend so much for a machine and train men to handle that machine so maximum utilization can be realized, when we spend much less in training to understand the human machine which is the most expensive one we have.

"In this emergency procedure factor, one has to go back to the appreciation, the understanding of the individual himself. You can't legislate safe thinking in anyone; you can't bludgeon it in. It is only going to be there because the individual has accepted it of his own free will. It would appear that the Number One job is to instill in the mind of each individual a firm appreciation of the problem; that a certain thing must be done a certain way because that is the right way to do it, not because the chief pilot will get you if you do it the wrong way. And all that goes back to basic training.

"We must have people doing this training who know how to train and who have an appreciation and an understanding for this human machine.

C. E. Koontz: "Mr. Davis, won't you have to have some sort of a criteria or curriculum to go by?"

W. O. Davis: "Indeed, you do. But I'm in no position to supply the answer. There are a lot of minds in this industry who are better qualified than I to find the answer."

Randy Carpenter: *"Implicit in everyone's remarks has been the stress placed on total technical training and inherent or learned judgment. Those two factors certainly must be present to accomplish any satisfactory degree of crew coordination. The delegation of authority by a good aircraft commander has been pointed out as being an excellent way to supervise or to be certain that cockpit procedures are carried out by those technically qualified to do so.*

"Mr. Koontz, would you give us your views on training criteria?"

C. E. Koontz: "Mr. Davis has covered it very adequately. The time is indeed right for a new approach to the whole concept of present-day training procedures. The human psychological approach is much better than simply trying to draw things out in black and white, because you can't anticipate every type of emergency which may occur.

"Mr. Davis, I'd like to ask you if you think individual crew members should be trained to act on their own initiative without waiting for an order or command from the pilot."

W. O. Davis: "That could apply especially to cabin personnel. From their standpoint, if it's obvious that no command is going to be forthcoming, they certainly are going to have to move on their own initiative."

C. E. Koontz: "Isn't it true that there are types of emergencies that are more likely to occur than others, and shouldn't training be concentrated along those lines?"

W. O. Davis: "Well, I'd like to see us get away from any training that stipulates the same identical situation year after year until, in the mind of the individual, that situation and that alone is the emergency, and if it digresses from that pattern, confusion reigns. We have had no end of good training with respect to physical reaction to emergencies. Now I would like to see an approach which would accent mental comprehension more than physical manipulation."

Capt. E. J. Smith: "During proficiency or hood checks, I realize you can't possibly put a pilot through all types of emergencies. Possibly in the near future, the entire proficiency check will be done in the Dehmel."

C. E. Koontz: "My boss is out in Denver taking a look at your Dehmel training program right now. We have a Dehmel ourselves and find it very useful."

Capt. E. J. Smith: "I'm happy to report that a large percentage of captains themselves hope that condition will come about. They want to go through these different emergencies (when they lose an engine, have two engines out, fires, etc.) that you can't do in the actual cockpit. The airlines recognize discrepancies that exist in proficiency checks and they are trying to do something about it. I think the day definitely will come when these proficiency checks will be run in Dehmel trainers and we'll do away with air work."

Randy Carpenter: *"Bill Shaughnessy,*

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will you begin a summarization of this crew coordination subject from the business aircraft point of view?"

Wm. E. Shaughnessy, Jr.: "The business-aircraft operator is showing an increased interest in crew coordination. Also, the insurance companies are stepping in with their required periodic checks. We realize that in our crew training we can't cover all the contingencies that might come up, but we are trying to cover the unusual circumstances. With the availability of the Dehmel trainer to the business-plane operator through such organizations as Flight Safety, Inc., etc., there will be an increase in the performance of business crews."

Robert E. Porter: "Assuring the proper type of mental alertness must be one of the big problems, and I suggest that 15 seconds of silent meditation before entering the more critical emergency areas, such as take-off, let-down or landing, would be worthwhile. Most people would prove much better in an emergency on take-off if, after the hustle and bustle of pre-flight preparation, they would quietly concentrate on how to handle the take-off."

Lou Achitoff: "From what we have seen of business-aircraft crews, they believe in crew coordination and appreciate the importance of it. They always are eager to work to develop a higher degree of such coordination. We find variations from crew to crew, but we learn from their experiences and they learn from ours.

"Business crews certainly have as high a degree of crew coordination as you find on the airlines since you have pilots paired more consistently in a way that is not possible on the airlines. Consequently, it makes for a more tightly knit team."

Randy Carpenter: *"In summary, gentlemen, I'd like to read a paragraph from one of Flight Safety Foundation's bulletins. I think it most nearly summarizes our collective points of view:*

"'The appointment of an aircraft commander is based on the principle that the miniature community on board the aircraft requires the leadership of a person vested with statutory authority. The aircraft commander is thus granted a status closely analogous to that of the master of a ship whom the law makes an uncrowned king on board his ship. Like the master of the ship, the aircraft commander is bound to exercise the wide authority that is vested upon him for the purposes for which it is intended.'

"Recently the Air Line Pilots Association stated in a memorandum that there must be leadership in the organization of the crew, and without it the entire operation becomes a fiasco, particularly when an emergency occurs. Without someone giving the orders and holding the show together, it would come apart and disaster would result. But, most important, the pilot must school himself in leadership and all the subtle psychology that is a part of it.

"In summation, then, the pilots must prepare themselves so that the crew looks up to them in technical knowledge, in ability, and in morale.

"Again, thank you, gentlemen, for your excellent contributions to this discussion."

+++

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NBAA

(*Continued from page* 23)

More NBAA Members Installing Airborne Radar

Inquiries concerning airborne radar installations for member business aircraft are being received by NBAA National Headquarters in increasing numbers.

At present, over 20 business airplanes are equipped with these unique avionic aids to safety and air navigation. The future growth of the market, particularly in the business-flying field, is enormous and still virtually untapped.

Three NBAA members, Bendix, Collins and RCA are in production of these devices and have large backlogs of orders. It is expected that these orders will exceed 1,000 in the next several months.

Many NBAA members have enthusiastically reported on the great value of this new storm-spotting and terrain-mapping equipment. Some of our member companies and corporations now using or having airborne radar installed include Kewanee Oil Co. (DC-3), Bendix Aviation Corp. (DC-3), United Airlines (Convair 340), Forest Oil Co. (*Lodestar*) Owens-Illinois Glass (DC-3), Kudner Corp. (DC-3), Arthur Godfrey Enterprises (DC-3), Pan American World Airway (DC-6's and DC-7's), Mine Safety Appliance Co. (DC-3), Corning Glass Co. (DC-3), and American Airlines (DC-7's). Others are investigating possibility of installing this ingenious device.

USC Offers a Three-Week Course in Aviation Safety

The University of Southern California has been conducting aviation safety courses for United States Air Force, Navy and Marine officers since March 1953. The military courses are eight weeks in length and include some 288 hours of instruction.

In response to requests for a shorter course to serve business pilots and commercial carriers concerned with the safety of flight, a three-week course, involving 100 hours of instruction is being planned.

Purpose of the Courses 1: To develop a basic understanding of the fundamentals of aeronautical engineering as applied to the operation of modern aircraft. 2) To provide information on aero-medical problems affecting passengers and air crews. 3) To develop an understanding of the psychological factors involved in personnel management, and in the operation of modern aircraft. 4) To develop an understanding of aircraft-accident investigation procedures and the findings of accident investigators as they contribute to the development of preventive measures. 5) To develop some basic procedures in the management of an accident-prevention program and the promotion of preventive practices.

Course Schedule: This course can be offered three times a year, in the months of January, February and March. Classes will meet from 3:00 to 6:00 PM and 7:00 to 10:00 PM daily and 9:00 to 12:00 AM on Saturday for a period of three weeks. Instruction will be conducted by the regular staff, supplemented by visiting lecturers.

For detailed information regarding the curriculum, write to: University of Southern California, University College, Office of Aviation Safety Training, Los Angeles, California.

now hear this . . .

Hiller Helicopters has established a new division for advanced research. A new building presently is being erected for the new division.

Thompson Products, Inc., has acquired Karl-Douglas Associates, Inc., by stock purchase.

Air Associates, Inc., has acquired exclusive rights to manufacture and sell a new low-cost single-axis autopilot for light and medium aircraft. Unit is called DART 1.

AERO CALENDAR

Sept. 8—Airwork Engine Forum, sponsored by Pratt & Whitney, Bendix, Millville, N.J.

Sept. 15—Airwork Engine Forum, sponsored by Pratt & Whitney, Bendix, Miami.

Oct. 4-6—11th Annual Spark Plug and Ignition Conference, sponsored by Champion Spark Plug Co., Toledo.

Oct. 5-7—Eighth Annual NBAA meeting and forum, Sheraton-Cadillac Hotel, Detroit.

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Fuels & Oils

(*Continued from page* 25)

It can likewise be shown that any combination of gate positions can be served by from one to four suppliers.

For purpose of further example, let us assume that Airline "A" has six assigned gate positions (Gates numbered 1, 3, 5, 7, 9, and 11). This airline is fueled by Oil Co. "X" which, therefore, would be assigned Storage Area "B" and the valves to the East of Gate Position 2 and to the West of Gate Position 13 would be closed, thus providing a complete segment of lines from Gate Position 1 through Gate Position 11 through which only the products of Oil Co. "X" would flow.

Let us assume that Airline "B" is assigned two gate positions (Gates 13 and 15). This airline is suppled by Oil Co. "Y" which, therefore, would be assigned Storage Area "A" and, since the valve to the west of Gate 13 is closed, Oil Co. "Y" also would have a completely segregated fueling system for Gates 13 and 15.

Let us assume that Airline "C" has four gate positions assigned to it (Gates 2, 4, 6, 8) and that Airline "D" also has four gates assigned to it (Gates 10, 12, 14, 16). Both of these airlines are served by Oil Co. "Z." This company would be assigned Storage Areas "C" and "D" and would have a completely segregated fueling system for each of its customers by closing the valves to the North of Gate 8 and to the South of Gate 10, recalling that the valve to the East of Gate 2 already has been closed. Any other combination of gate positions, airlines, and oil companies can be worked out as well.

For instance, there might be the case in which, at times, airlines occupying adjacent series of gate positions would share a center gate. For example, suppose Airline "A," which occupies Gates 1, 3, 5, 7, 9, and 11 and is served by Oil Co. "X," sometimes shares its Gate 11 with Airline "B" which normally occupies Gates 13 and 15 and is supplied by Oil Co. "Y." A change in valve positions at Gate 11 will permit a change of supplier to that gate with a minimum of product co-mingling. (With this, of course, it would be mandatory that the same grade of fuel be used —otherwise even a minimal co-mingling would be improper and, in the case of most fuels, quite probably hazardous.)

The definition of minimum co-mingling (and the emphasis on the *same grade of fuel* must always be repeated) is arrived at by looking at lines involved.

The laterals are 4 inches in diameter, the hose in the pits is collapsible (evacuated). Therefore, there would be only 30 to 35 gallons of the product of the previous supplier in each lateral and pit, or a total of 60 to 70 gallons in the two pits. Since this "intermingling" takes place only on the first delivery after a change in valve positions is made, it is felt this is not co-mingling in the accepted sense of the word.

Such sharing of a gate position would require no bookkeeping on the part of the airlines or the oil companies. When a change is made, 60 or 70 gallons of a product other than its normal supplier's would be delivered to the plane of the airline using the gate at the moment. Since both airlines use this trapped fuel, there is no overage or shortage in the long run.

If the airlines sharing a gate position do *not* use the same fuel grades, no alternating valving would be used.

Suppose Airline "A'" uses 100 and 115 performance number fuels and that Airline "B" uses only 91 octane. (Or, imagine here the separate uses of kerosene or gasoline-type jet and turbine fuels.)

In this case, Oil Co. "Y," supplying Airline "B," would arrange valving so that 91 octane distribution line served Gate 11 as well as Gates 13 and 15. Gate 11 then would serve 100 and 115 octane fuel of Oil Co. "X" and 91 octane of "Y."

Delivery of the product to the four segregated storage areas shown in the drawing is accomplished by transport trucks using the same routes over the airport taxi-way and ramp areas as are used by the airport tenders in a co-mingling scheme. (Details of a system for other than truck delivery will be the subject of a subsequent presentation in *SKYWAYS.*) It is felt that the delivery to the segregated storage areas by transport trucks operating along the outer edge of the apron is entirely safe and entirely feasible. There would probably never be more than three or four of those 4,000-5,000-gallon capacity delivery vehicles on the airport at one time, while at many airports, 14 to twenty-five 4,000-gal. airport tenders are in use.

The difference between the installation costs of segregated fuel system described here and equivalent system on a co-mingling basis has been estimated by engineering departmens of three petroleum companies, each working independently.

Three estimates correlate closely and indicate that segregated system would cost 94, 95.4 or 96% of co-mingling system's cost.

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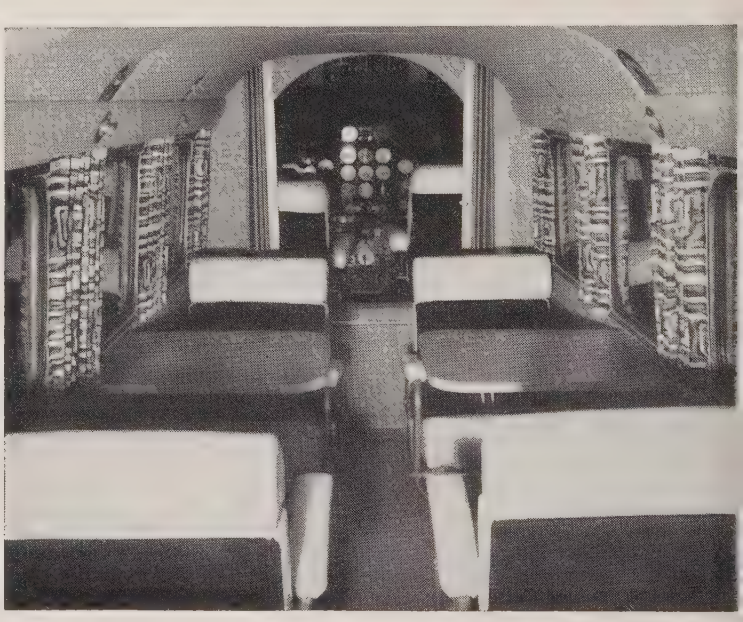

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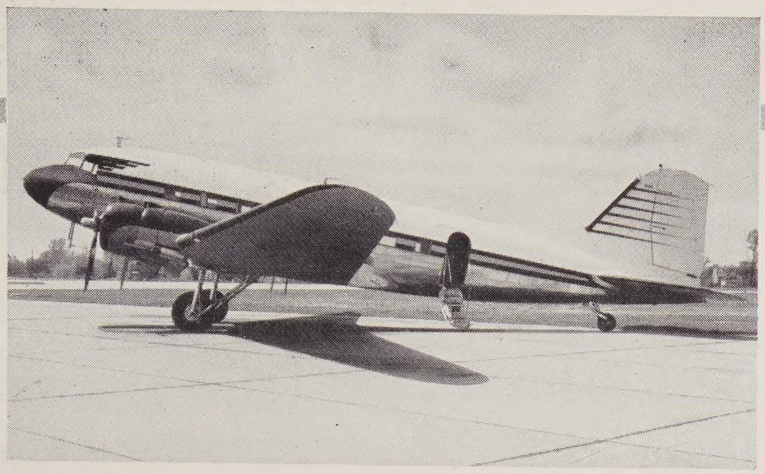

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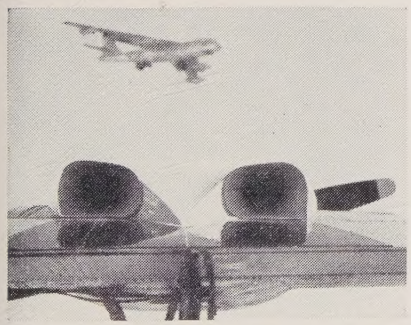

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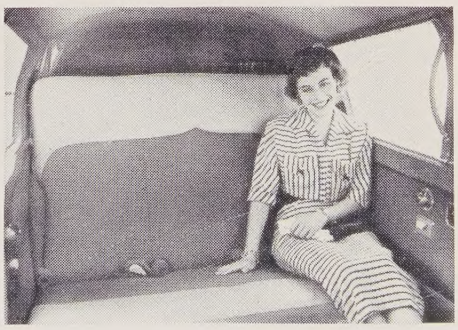

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